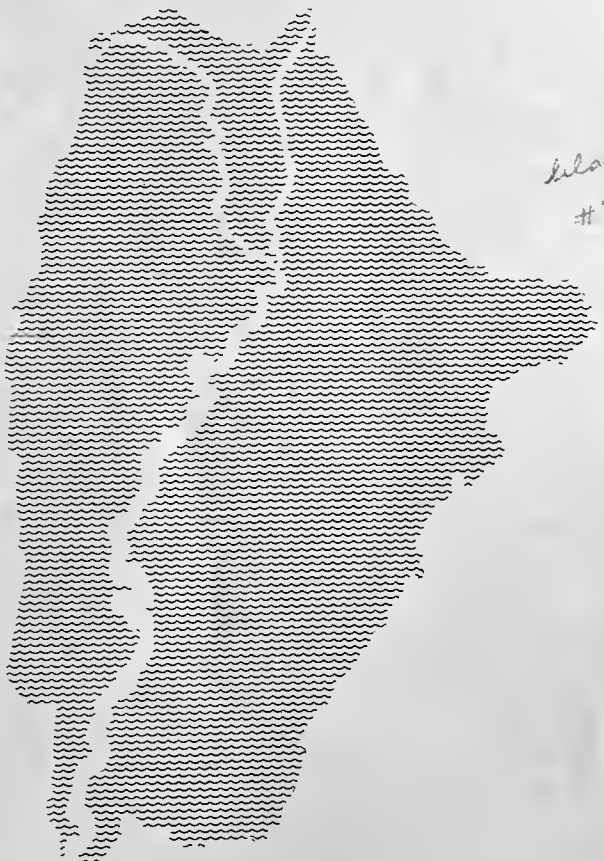
A Program for the

MONOCACY WATERSHED



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A PROGRAM FOR THE MONOCACY WATERSHED

MARYLAND STATE PLANNING COMMISSION

JUNE 1951

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The Water Pollution Control Commission of Maryland

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The State Roads Commission of Maryland

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The Department of Forests and Waters of Pennsylvania

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Multiply such gullies by thousands and its clear why the Monocacy is the muddiest Potomac tributary 32

On the well planned and well managed farm, erosion is halted and the good soil stays on the farm and pays dividends 32

This flood was not "an act of God," man is responsible 41

It is easy to see why water and topsoil flows down to the bottom of this corn field 41

A good plantation is a reassuring sight to all who love the land. . . 43

Thrasher farm pond, it spells protection against fire, conservation of water resources, prevention of erosion, and recreation 43

PREFACE

The Monocacy River Watershed is a geographic area which includes the varied elements of lowlands, mountains, forests, streams, farms and towns but, nevertheless, is an area of common interests and problems. The productivity of the farm affects the sales of the merchant. On the other hand, the town dwellers are the consumers of the farmer's products. What affects one segment of the population of the Watershed is the concern of all of the 100,000 people living and working in the area.

Serious basic problems have arisen within the Monocacy River Watershed as a whole though the rise of specialized forms of agriculture has obscured the serious fact of the progressive deterioration of the land with all of the problems that result from the wasteful exploitation and neglect of land. The lessons of conservation and planning are learned the hard way.

Prior to the formation of the Monocacy Watershed Council many associations and agencies were carrying on programs of research and action on various aspects of the Watershed problem. These programs, however, were unintegrated and were limited in scope; either they were applied to a specialized field of knowledge or they encompassed a small geographic area. Furthermore, any effective plan of action would involve the many thousands of people in the area and without their interest and support such a plan would be doomed to failure. In recognition of these facts, the Monocacy Watershed Council was formed in September of 1949 in order to focus all of the available technical knowledge upon all of the region with the support of all of the people.

The stated purposes of the Council are sixfold:

1. The appraisal of the conditions in the area and the determination of the action to be followed in correcting these conditions;

2. Preparation of a plan of action, including the means for carrying it out;

3. Establishing policies and fixing responsibility;

4. Correlating the activities of the agencies concerned;

5. Disseminating information; and

6. Utilizing, not duplicating, existing facilities.

Such a program is necessary if the urgency of the problems is to be brought home to all concerned and particularly to the farmers. The technical agencies cannot be expected to develop public opinion and secure citizen action as well as to provide their specialized services. In any case, the whole job should not and cannot be left to government to perform.

A council, such as is constituted in the Monocacy Watershed Council, is a desirable instrumentality of correlating all the constructive forces of the area. Its task is not to administer but to inform, arouse, unite, correlate and bring the wisdom and collective judgement of many good minds and experience to bear on the preservation and development of a great region.

INTRODUCTION

The purpose of this report is to present the Watershed Council with material which will serve as a basis for action in preserving and utilizing the resources in the Monocacy Basin. The report itself does not offer a detailed program of action but is intended to be a presentation of the impact of the problems in the Monocacy Watershed that will lead to action by the Council. The report utilizes the research and field studies made in the Watershed by a number of the agencies cooperating with the Council. Without liberal use of and quotation from this basic material, the report would not have been possible.

The report approaches the subject in terms of the Watershed as a whole, using data on subwatersheds primarily for illustrative purposes. The future history of the Monocacy Basin cannot be determined wholly within its boundaries as it lies within the area of influence and requirements of a large region which includes two great cities, Washington and Baltimore. However it appears clear that the problems with which this report is concerned can be largely met within the boundaries of the Monocacy area and through the initiative and efforts of the people of the area.

It is further clear that the approach to a program for the Monocacy must be broad in the sense that there is not just one problem or one solution or one source of prevention and improvement. The history of all watersheds proves this to be so.

While this report gives detailed attention to soil and water resources, it is not the land or the river and its tributaries as such, with which we are concerned. It is the economy, culture and welfare of the 100,000 inhabitants of the Monocacy area which are at stake in the future of the land and the water.

DESCRIPTION

The Monocacy River is the largest Maryland tributary of the Potomac. Its basin comprises a total area of 970 square miles of which 742 square miles or 76.5 per cent are in Maryland and 228 square miles or 23.5 per cent are in Pennsylvania. The boundaries of the basin are shown on map I, page 3, of this report.

The Monocacy Basin is approximately 48 miles in length along its north-south axis of which 14 miles are in Pennsylvania. Its greatest width from east to west measured approximately four miles south of the Pennsylvania-Maryland line is 34 miles.

The river is formed by the confluence of Marsh and Rock Creeks at the State line. From this point the river meanders southwesterly, a river distance of 58 miles to its junction with the Potomac. Its fall is quite gradual, dropping from 370 feet above sea level at its origin to 200 feet at its mouth, an average gradient of approximately 3 per cent.

Nearly 85 per cent of the watershed or 823.7 square miles lies within the Piedmont Plateau. Some 15 per cent or 146.9 square miles is in the Appalachian Mountains. Westward from the Monocacy, from the Potomac River to Pennsylvania, a comparatively flat plain extends to the base of the Catoctin Mountains. Averaging five miles in width, it rises an average of less than 250 feet to the base of the mountains, generally located at an average of 500 feet above sea level, giving an average slope to this plain of less than 1 per cent.

North of the Pennsylvania line this same generally flat area continues west of Marsh Creek, except for hills rising several hundred feet above the valley floor.

MAP I

MONOCACY RIVER WATERSHED

MARYLAND AND PENNSYLVANIA

SOURCES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MARYLAND STATE PLANNING COMMISSION

West of the plain, beginning about six miles southwest of Frederick, the western boundary of the basin rises to the ridge of the Catoctin Mountains at an elevation over 800 feet, and from about five miles northwest of Frederick maintains an average elevation of over 1,600 feet to the northern end of the basin in Pennsylvania. This western water divide reaches its maximum elevation of 1,800 feet in Maryland at Buzzard Flats west of Catoctin Furnace and 1,960 feet at the headwaters of Marsh Creek in Pennsylvania.

This mountain mass, with its rapidly falling streams and sometimes precipitous slopes, varies in width from two miles at a point west of Frederick to about eight miles west of Emmitsburg and extends through Pennsylvania along South Mountain with an average width of three miles.

East of the Monocacy River the land rises an average of less than 600 feet from the river to the eastern boundary of the basin, where Parrs Ridge, with an average elevation around 800 feet above sea level, forms the eastern water divide, the distance from the river averaging about five miles.

While the average rise from the river to the eastern boundary is only about 1 per cent, the land is more broken in character than the plain to the west, with numerous hills and ridges rising rapidly to elevations of several hundred feet above its streams and branches.

THE NATURAL RESOURCES

In the Monocacy watershed, nature provided a balanced combination of resources of land, water, forests, and animal life which no destructive forces impaired except the unusual fire caused by lightning, geological changes or the unusual flood caused by abnormal rainfall. If forested areas were visited by fire, destroying the underbrush and trees, nature in time rebuilt the forest with new growth. Erosion caused by excessive rainfall was kept to a minimum by the extent of the ground cover and the capacity of the soils to retain a large portion of the rainfall.

The principal causes of the destruction of the natural resources are man made. Before presenting these problems, descriptions of the resources and of their development are necessary. This section describes the natural resources.

Soils

The soils of the Watershed are of numerous types. They fall into these general classifications: shales, sandstones, limestone, piedmont, mountain, and alluvial. In view of the structure of the watershed, the nature of the soils generally is such that, if unprotected, they lend themselves to much erosion.

The shale soils, unproductive and of low water holding capacity, are highly erosive if without adequate forest protection. The sandstones absorb water more readily and are the least erosive. The fertile limestones are subject to severe erosion but respond readily to treatment. The piedmont soils, like the limestone, are fertile and erosive. The rough stony mountain soils are forested to a great extent. Their capacity for

water storage is low and they require a good forest cover to prevent excessive run-off. The level alluvial soils , while not subject to erosion, are subject to deposition, swamping, and bank cutting.

With such characteristics, the soils of the Watershed functioned satisfactorily under undisturbed natural conditions with adequate forest cover. It was a different story, however, when man cleared three-fourths of the land for agriculture without practising effective management of the Watershed.

Fertility

The high agricultural productiveness of the Watershed as a whole is a matter of record since for decades Carroll and Frederick counties in Maryland and Adams County in Pennsylvania have been leading farm counties. The variations within the Watershed as to natural suitability for tillage, are great, due to slope, stoniness, drainage, degree of erosion, depth and characteristics of the soils and other factors. Thus, for example, two-thirds of the Piedmont Upland, which comprises the southeastern one third of Frederick County and all but the northwestern one fifth of Carroll County, is suitable for tillage. In the Frederick Valley, 94 per cent of the land is suitable for cultivation. In the Appalachian Mountain area, nearly two thirds of the land is too steep or too stony for use as cropland.1/

Rainfall and Run-off

The rain and the snow that fall on the Watershed are among its vital resources. Without them, the area would have no significant past,

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1/ The Physical Features of Carroll County and Frederick County, Department of Geology, Mines and Water Resources, Board of Natural Resources, State of Maryland, 1946, pp. 192-193.

present or future. The amount, distribution and disposition of this precipitation, in concert with the action of the sun and the response of the soil are the basis of the present civilized development of this geographical portion of the State.

In simple terms, it has been stated that it requires 50 gallons of water to produce an ear of corn and 19 inches of rainfall to produce 35 bushels of corn on one acre of the land.

The precipitation in the Watershed, if properly conserved, is ample for all foreseeable needs of a large population.

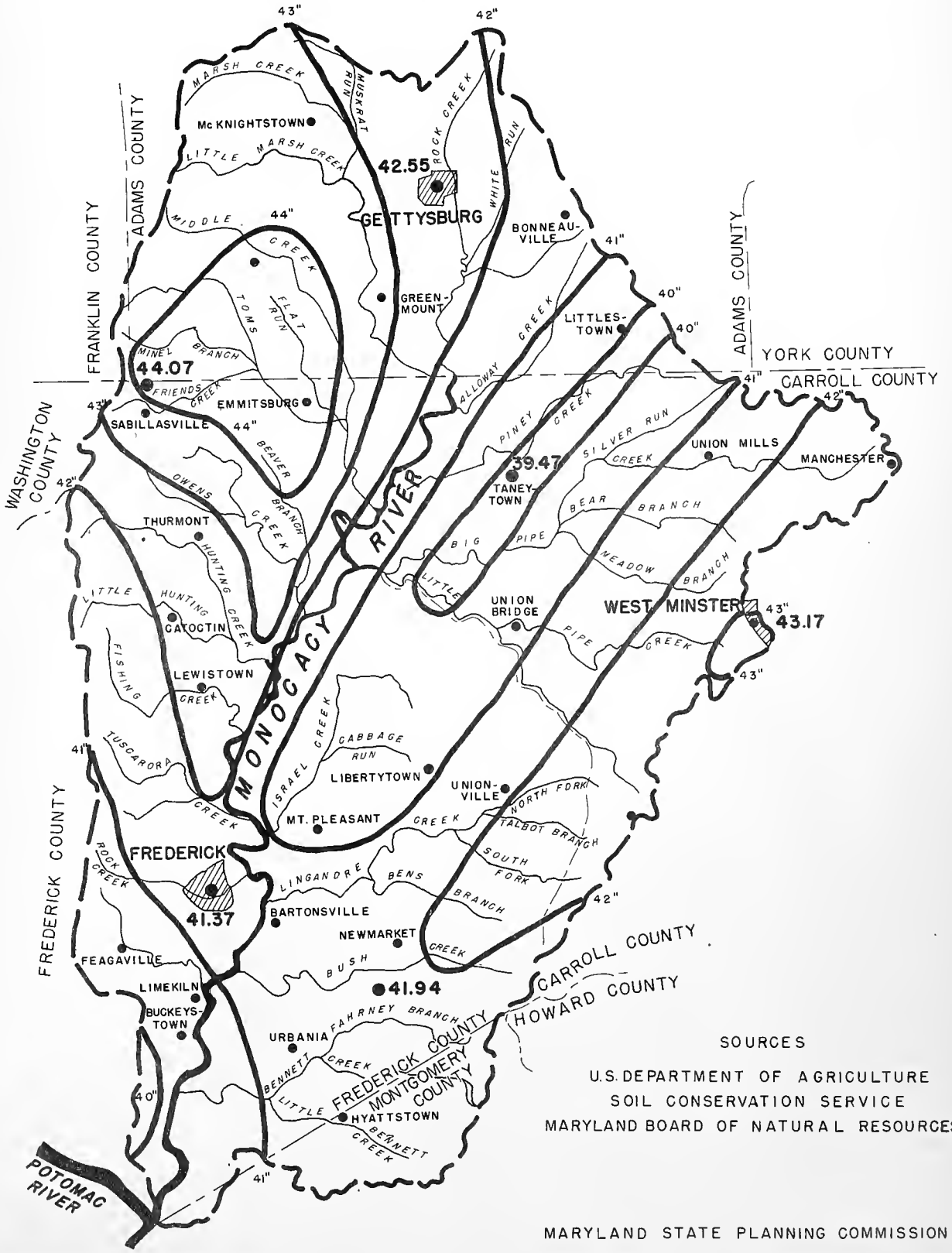
In a climate of generally moderate winters and warm, humid summers, the average annual rainfall has been 42.44 inches.1/ The geographic distribution of the average annual rainfall in the area is shown on Map II, page 8. There are occasional sudden intense thunderstorms causing flash floods. Despite big fluctuations within short periods, over a long period of time there have been no great changes in rainfall. The average annual amount is greater than in the Potomac Basin as a whole which is reported as 38 inches. The average annual total for Carroll and Frederick counties, 43.89 inches, is greater by 2.25 inches than the average annual total for Maryland. Not only is the precipitation fairly well distributed during the months of the year, sufficing for agricultural purposes from March to September, but summer droughts are rare and droughts at other seasons have slight importance.2/ The balance maintained by nature in the disposal of precipitation has been upset in the Monocacy Watershed by a failure to employ wise land management practices. This may be illustrated by comparing the run-off in the Monocacy Watershed with that of other areas.

1/ From statistics of the United States Weather Bureau.

2/ Ibid., p. 238.

MAP II

AVERAGE ANNUAL PRECIPITATION
MONOCACY RIVER WATERSHED
MARYLAND AND PENNSYLVANIA



SOURCES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MARYLAND BOARD OF NATURAL RESOURCES

MARYLAND STATE PLANNING COMMISSION

The average annual run-off in the Watershed from 1900 to 1943 was 16.3 inches according to Maryland Stream Flow Records, 1945. The variations between the maximums and the minimums of run-off have been very great. As recorded at the Jug Bridge gauging station for the period, 1900 to 1947, the maximum flow was 2,881 times the minimum. The wide variations in the Monocacy are much greater than those in other streams in Maryland, such as, the Susquehanna, the Patapsco at Reisterstown and the Patuxent, according to the Water Resources Commission Report of 1933.

Under natural conditions, a large proportion of the rainfall is absorbed into the soil cover to be utilized by the vegetation or to find its way slowly underground into streams. Under such conditions, there are no extremes between maximum and minimum run-off, and less high water and less low water than is now seen in the Monocacy and some of its tributaries at the present time.

For example, any rain that causes a substantial run-off quickly sends Linganore Creek over its banks. It reaches peak height quickly and falls quickly.[1/] This is true of other streams flowing into the Monocacy from the east. If the land drained by these streams were properly managed, there would be fewer floods and less low water; in other words, a more even flow would be evident.

Ground Water Resources

The porosity of the water-bearing rock in the Watershed is generally low. For this reason the fluctuations of the water table may be rather large, as the rocks are not capable of storing large amounts of water. The decline of the water table at Lewistown has led the Game and Inland Fish Commission to shift some of its species of fish to other hatcheries because

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1/ U. S. Soil Conservation Service, Frederick, Maryland.

of insufficient water in its pools. The lack of storage capacity may also account for larger volumes of run-off compared with areas of higher porosity. There is no indication that the ground water level has been seriously lowered by the wells in use.

Public Water Supply

The municipalities and plants of the Monocacy Watershed draw their water from streams, wells and springs. The larger communities, Frederick and Westminster, Maryland and Gettysburg, Pennsylvania, depend on tributaries of the river for their water supply, although Frederick has a supplementary supply in its reservoir in the Catoctin Mountains. Public water consumption is very small compared with rainfall, the ratio to annual rainfall being seventeen one hundredths of one per cent with the total water comsumption being estimated at forty-one one hundredths of one per cent of rainfall.1/ The estimated daily water consumption of the public supply system of Frederick is 1,708,000 gallons for a population of 18,092 and for the population of the entire Monocacy Watershed, 8,750,000 gallons. By contrast, an inch of rainfall over the entire basin equals 16,857 million gallons of water.

Ample Supply for Industrial Purposes

When the quantities of run-off, 16,39 inches annually, less the present consumption through public use is calculated, an enormous total volume in the streams of 273,092 million gallons is indicated. By comparison the City of Frederick consumes annually less than 624 million gallons.

However, all that can be relied on is the minimum flow. If for any community or industry, this minimum flow at its pumping station should fall below the minimum requirements, a shortage would exist. This situation

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1/ The Physical Features of Carroll County and Frederick County, Department of Geology, Mines and Water Resources, Board of Natural Resources, State of Maryland, 1946, page 6,7.

points to the need for raising the minimum flow through soil conservation practices or storage reservoirs or both.

The water in the river is somewhat softer than the average, ranging from 20-70 parts per million and the general quality of the water is considered average, although soil is present and pollution is in evidence.

Forests

The Natural Resources Inventory of the Monocacy Watershed in 1948, made by the Board of Natural Resources of the State, reported that forests covered 25 per cent of the area of the Watershed, and that they were growing at the rate of 49 cubic feet per acre. As of the present, this growth would mean that the forests average over 1,500 cubic feet per acre.1/

In the Maryland portion of the Watershed, 122,000 acres were reported in woodland with an additional 349 acres in plantings. In the Pennsylvania portion, the 62,500 acres in forests were divided into 28,000 acres in farm forests, 17,000 in non-farm forests and 18,000 in State forests. Seventy-four per cent of the forest acreage was reported to be oak and practically all to be hardwood.

As only 13 per cent of Carroll County is in forest, the greater part of the forested portion of the Watershed in Maryland lies within Frederick County, 28 per cent of which is forested. Two-thirds of the wooded area is in the western half of the county in continuous areas of the mountains. The Monocacy Valley proper has relatively little woodland and the farm woodlots generally are isolated small areas. Generally, the woods have been cleared from the land that could be cultivated.

In the mountain section, chestnut, scarlet, black, white and red oak, hickory and tulip poplar are the principal species of trees. Thomas Scharf, in his History of Western Maryland (1882), referred to oaks and

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1/ Report of the Commission on Conservation of Natural Resources, December 1, 1948.

chestnut as the principal trees in this part of the Watershed. But the chestnut blight has ravaged the chestnut.

The important timber trees are white oak, red oak, and chestnut and tulip poplar. Oak accounts for 65 per cent of the timber cut, 20 per cent is chestnut, and 15 per cent are miscellaneous species. The commercial forms in which the timber is cut are principally railroad ties, staves, pulpwood, shingles, lath and cordwood. The home use is for building, fuel and fence posts.1/

Many thousands of acres of the forests are out of commercial use since they are contained in State and municipal areas and in forest areas in the Catoctin mountains. Most of the remaining acreage is at present of pole size rather than saw timber. The following table provides an estimate of the approximate board feet of timber in the Maryland portion of the Watershed and their value.

Estimate of Board Feet of Timber and Value, Maryland Section of the Monocacy Watershed

	Acres	Average Board Feet	Board Feet	$ Per M	Value
Saw Timber	40,660	4,000	162,640,000	20	$ 3,252,800
Pole Timber	81,320	1,000	81,320,000	15	1,219,800
	121,980		243,960,000		$ 4,471,600

Minerals

The Board of Natural Resources lists lime, cement, crushed stone, clay, soapstone, and flint as mineral products produced in Carroll and Frederick counties.2/ Building and ornamental stones, building sand, iron ore and other products were formerly produced in these counties.

1/ Data on forests are principally from The Physical Features of Carroll County and Frederick County, Department of Geology, Mines, and Water Resources, 1946.

2/ Ibid.

Game and Fish

Scharf recalled that the Bennett Creek area of the Watershed in Montgomery County had been the habitat of black bear, grey wolf, panther, wild cat, gray and red fox and other animals and of an immense variety of birds and reptiles. But that was history even in 1882 when his work was published.

When the first report on the catch of fur bearing animals, which was recently required by law, is published, the extent of animal life now present in the Watershed will be known. In spite of the intensive development of the land, the destruction of three-fourths of the forests and the pollution of streams, many species of small game are to be found. Deer are common in the mountain areas of the western part of the Watershed and turkeys are being introduced. Oppossum, raccoon, squirrel, rabbit, skunk, muskrat, quail and pheasant are common; mink, weasel and fox are found in less abundant numbers.

A survey made by the Maryland Board of Natural Resources in 1948 revealed that the only game fish present in the Monocacy was the small mouth bass; that pan fishes included rock bass, yellow belly sunfish and pumpkin seed; and that the food fishes were channel catfish, yellow and brown bullheads, eastern redhorse, white sucker, fallfish, eels and hog suckers.

The Board's report indicated that from April through September, 12,000 fishermen caught about 30,720 fish, and the average fishing time per man was 6.25 hours. The catch included 16,000 catfish, 6,000 of the sunfish family, 920 small mouth bass (of which 340 were legals) and 7,800 fish of other species.

Healthfulness of Climate

The growth of the Watershed in population and its selection as a

site for colleges and State institutions are among the evidence of the freedom of its climate from basically unhealthful conditions. The winters are generally mild and the weather is free from the extreme and sudden changes which aggravate illness and cause discomfort. The area enjoys much sunshine; available data indicate that the sun shone 59 per cent of the possible time. The heat and humidity of the summers are relieved by breezes in the mountain areas and even by occasional drafts which sweep through the valleys of the lowlands. The annual mean maximum temperature in Carroll and Frederick counties from 1892 to 1944 was 63.3; the mean minimum was 42.9.1/

1/ The Physical Features of Carroll County and Frederick County, Department of Geology, Mines and Water Resources, Board of Natural Resources, State of Maryland, 1946, pp. 231-246

SOCIAL AND ECONOMIC CHARACTERISTICS OF THE MONOCACY AREA

The Monocacy Watershed is in effect a well-defined geographical unit in which 100,000 or more men, women, and children live, work and play. This section of the report identifies the composition of the population, the economic trends and the cultural institutions of the people.

Basin Area by Counties

The following table shows the distribution of the basin area by counties:

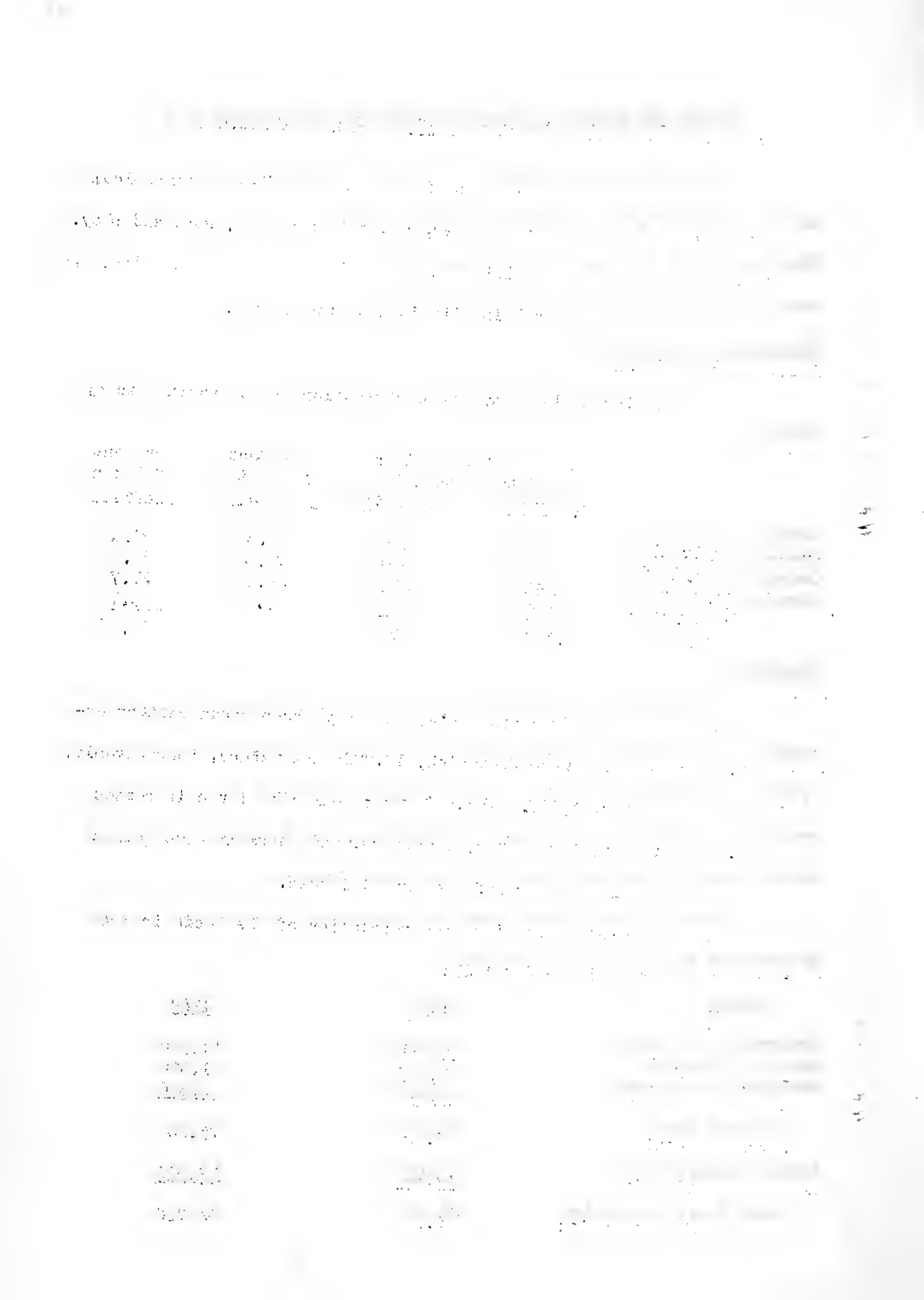
	Total Area in Square Miles Total Amount In County	In Basin	Per Cent of County Area	Per Cent of Basin Area
Adams, Pennsylvania	526	228	43.3	23.3
Frederick, Maryland	670	500	74.6	51.3
Carroll, Maryland	456	212	46.5	21.7
Montgomery, Maryland	506	30	5.9	3.7
Total	2,158	970		100.0%

Population

According to 1950 census data, the only three urban centers exceeding 5,000 population were Frederick, 18,082; Gettysburg, Pennsylvania, 7,043; and Westminster, 6,137. These figures represent large increases over 1940. Mount Airy, Manchester, Taneytown, and Thurmont also gained while Brunswick and Emmitsburg suffered small losses.

The following table gives the population of the basin in 1940 by counties and an estimate for 1949:

County	1940	1949
Frederick, Maryland	47,656	51,500
Carroll, Maryland	19,025	21,500
Montgomery, Maryland	2,719	2,800
Maryland Total	69,400	75,800
Adams, Pennsylvania	17,180	18,900
Total Basin Population	86,580	94,700



The Watershed population has now clearly reached or passed 100,000.

Residential and Occupational Groups

In terms of residential location, the population groups in the Watershed are those living in urban communities, those in incorporated places of less than 2,500, the rural non-farm residents, and the farm population. In both Carroll and Frederick counties, which account for the greater part of the area of the Watershed, farm population has declined heavily beginning at least as early as 1905. This loss in Frederick County was 3.2% and in Carroll, 11.5% from 1925 to 1930. Since then until 1945, there were further losses of 9.4% in Carroll and 17% in Frederick County. By contrast the total population in Carroll County increased nearly 30% and in Frederick 18% during the three decades ending in 1950.

In 1945 Frederick County farm population was not more than one-fourth of the total population of about 60,000 compared with its position of 51% in 1930. In Carroll County, the farm population of 13,430 was less than one-third of the total population of the county while in 1930 it was nearly one-half.

The rural non-farm population is large in both counties. Together with the small number in unincorporated towns, this population comprised 28% of the total Frederick County population while residents in incorporated places were 45%. In Carroll County, the farm and urban populations each accounted for about 30% of the population of 44,000; the remaining 40% was composed of rural non-farm residents.

By 1949, persons employed in manufacturing, wholesale and retail trade, construction, service industries and other urban occupations had

risen to 9,056 in Frederick County while persons in farm employment were estimated to have decreased to 5,500. Similar trends are evident in Carroll County.

The trend indicates a decreasing number of persons living and working on farms with a concomitant increase in urban and non-farm rural residents who work in industrial and commercial establishments.

Trends in the Number and Size of Farms

During a 45-year period ending in 1945, the number of Carroll County farms declined by 6% to a total of 3,128; since then, the decrease has been even more rapid, farms numbering 2,766 in 1950. In Frederick County the corresponding decline was 9% to a total of 3,392 in 1945; the number in 1950 was 2,977.

During the 45-year period, the percentage of Carroll County land area in farms declined from nearly 97% to 90% and in Frederick County from 88% to 81.5%.

The average size farm has recently followed an opposite trend. Between 1940 and 1950, the average farm in Carroll County increased in size from 80.6 to 91.3 acres. In Frederick County, the corresponding growth was 14.3 acres to a 1950 average of 114.1 acres. However, the increase in farm size has occurred since 1940; prior to that year the trend was downward. This change coincides with both the increased trend to dairying and the accelerated loss of good soil by erosion.

The improved farm area has declined substantially, as it has generally throughout the State. Cropland acreage has decreased while land used for pasture has shown very large acreage increases.

The decline in the number of farms in Adams County, Pennsylvania, was from 3,149 in 1945 to 2,668 in 1950 or 15 per cent. The decrease in the number of farms was general throughout Maryland and Pennsylvania. In

Maryland only Charles, Howard and Prince George's counties did not record declines while the decrease in Anne Arundel County was negligible.

Farm Ownership

Another trend which the counties of Frederick and Carroll share with the State at large, is in the relative decline of tenant-operated farms. The proportion of tenancy in Carroll County was cut in half from 1945 to 1950, falling from 20.7 per cent to 10.4 per cent. The decline in Frederick County was from 25.5 to 22.1 per cent.

The decline in acreage rented is illustrated in Carroll County in the following table:

Farm Acreage Owned and Rented, Carroll County
1940, 1945, 1950

Year	Acreage Owned by Operator	Acreage Rented by Operator
1940	169,446	71,904
1945	189,361	73,859
1950	195,183	50,484

In Frederick County, farmland owned by the operators in 1950 was 237,146 acres compared with 120,842 acres rented by operators.

Significant Trends in Use of Farmland

The trend towards more ownership and less tenancy must be regarded as wholesome for the economy and general well-being of the area. There are certain other changes, however, in the uses of farmland which are injurious to the soil and represent uneconomical uses of the land. They serve to explain part of the major problem of the Watershed which will be identified later in this report.

We refer to the trend toward increased pasturing of stock in woodland in both Carroll and Frederick counties which has been evident since 1944. It is true that the great bulk of the farm woodland is not pastured. Nevertheless, in the period 1944 - 1949, there was a substantial increase in the practice which is highly injurious to the forest cover and is a

contributing cause to erosion and soil loss. The following table indicates the number of farms and acreage involved:

Statistics on Farm Woodlands, Pastured and Not Pastured
1944-1949, Frederick and Carroll Counties, Maryland

County	Year	Woodland - Pastured		Woodland - Not Pastured	
		Farms	Acres	Farms	Acres
Carroll	1944	264	3,195	2,094	34,475
	1949	336	3,784	1,888	34,041
Frederick	1944	490	10,236	1,309	36,569
	1949	613	11,190	1,349	35,736

Source: Preliminary Reports U.S. Census of Agriculture, Farm Characteristics and Products, January 1951.

Types of Farms

The mounting trend toward dairying as the predominant type of farm use and toward specialization in general,is further borne out in the following statistics from the Census report cited above.

Types of Farms in Carroll and Frederick
Counties, Maryland, 1950

County	Live-stock	Field Crops	Vege-table	Fruit & Nut	Dairy	Poultry	Gen.	Misc.
Carroll	264	95	55	--	801	315	295	941
Frederick	206	71	20	21	1,369	121	233	936

It is obvious that general farms now comprise only a small percentage of the farms in the two counties. There is a similar trend in Adams County where, however, fruit farms are relatively much more important than they are in the Maryland portion of the Watershed.

Value of Farms and Farm Products

Although the ratio of farmland to the total area of the counties has declined and the number of farms has correspondingly decreased, the average value of the remaining farms and the worth of their products have greatly increased, even allowing for the factor of inflation in recent years.

The average value of farms in Carroll and Frederick counties more than doubled from 1940 to 1950. In Carroll, it was $4,968 in 1940, $6,841 in 1945 and $10,892 in 1950. In Frederick, the rise was from $6,254 in 1940, to $7,796 in 1945 and to $14,017 in 1950. These figures from the Census Bureau give no breakdown for special types of farms. Estimates from various sources give $20,000 to $25,000 as the value of a 100-acre dairy farm.

The decade, 1939 to 1949, marked a declining production of corn harvested for all purposes in favor of corn harvested for use as grain. Winter wheat threshed fell off drastically in both counties in terms of farms reporting, acreage and bushels. Barley production fell off in Frederick but increased in Carroll.

Meanwhile dairy products were mounting. In Carroll County, 940 farms sold whole milk in 1949 versus 1,131 in 1944, but the total poundage sold in 1949 was 10,000,000 greater than in 1944. Pounds of butter fat sold in 1949 were twice those sold in 1944. In Frederick County the trends were similar.

The following table strikingly indicates the relative position of dairying in the value of products sold.

DOLLAR VALUE OF FARM PRODUCTS SOLD, FREDERICK AND CARROLL COUNTIES, MARYLAND, 1944 AND 1949

County	Year	All Farm Products	Crops	Livestock & Livestock Products Dairy	Livestock & Livestock Products All Products
Frederick	1944	$11,227,411	$2,275,126	$6,465,194	$8,915,680
	1949	16,087,464	2,275,733	10,277,216	13,784,142
Carroll	1944	8,613,429	2,136,987	3,140,794	6,456,150
	1949	11,433,436	2,233,446	4,434,818	9,184,917

Source: Preliminary Census Report, January 25, 1951.

The forest products sold in 1944 in Frederick County brought only $36,603 and the sales in 1949 had fallen to $27,539.

These contrasting figures on the value of farm products, dairy products and forest products provide striking evidence of the change in the face of the land since its development was undertaken.

Farm Purchases

Along with the mounting value of farm products has gone increased purchases by farmers both for business purposes in operating the farms and for the enjoyment of their families. Thus, farms supplied with electricity grew in Carroll from 1,925 in 1940 to 2,594 in 1950 while in Frederick they increased from 1,673 to 2,785. This means that all farms in Frederick except 192 and all in Carroll but 172 had electricity. Telephones increased in Carroll from 1,039 to 1,603 and in Frederick from 1,290 to 1,654.

Twenty-six out of every 27 farms in Carroll County have a tractor and the ratio in Frederick County is nearly as great. There are many more farm-owned automobiles in both counties than there are farms by a margin of several hundred in each county. Sixty-three per cent of the farms in Carroll County have motor trucks and 62 per cent in Frederick.

General Economy of the Area

Manufacturing and wholesale and retail business have been expanding in Frederick, Westminster and smaller communities of the State along with the growth of farm production. A few figures give an idea of the volume this expansion has attained.

Value added by manufacture in Carroll County in 1947 amounted to $17,601,000 while that in Frederick totaled $12,130,000. Retail sales in Carroll were $26,692,000 and those in Frederick County were $49,988,000 in 1949. The assessed value of real and personal property in Carroll was $62,294,000 and in Frederick it was $80,702,000 in 1949.

The greater part of the Monocacy Basin in Adams County, Pennsylvania, is agricultural, with fruit growing, poultry, dairying and truck farming the major enterprises. The value of these and other farm products sold in 1945 in the entire county was about $10,363,760. Value added by manufacture in Adams County in 1947 totaled $17,229,000. Retail sales in the county were $31,800,000 in 1948, according to the Bureau of the Census. The 1950 assessed valuation of taxable real property was $17,006,345 and its market value, $76,936,534. Gettysburg, the principal city, has creameries, canneries and food processing establishments among other industries.1/

Transportation

The Watershed is traversed by the Pennsylvania, Baltimore and Ohio, Western Maryland and other railroads and is crisscrossed by a network of Federal and State highways. The latter include the heavily travelled U.S. 15 and 40, arteries of north - south and east - west traffic. The

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1/ From data sheets, State Planning Board, Harrisburg, Pennsylvania.

railroads and highways connect the principal urban centers and much of the farming area with the great metropolitan centers of the east. Bus lines serve the principal centers of population. Among other elements, the major transportion facilities are shown on Map III, page 24.

As to the problem of the farmer's access to market centers, this is steadily being met. There has been much road building in the last five years. There are an estimated 1,672 miles of Federal, State, County and Municipal roads in the Watershed. Of this mileage, 867 or 51.8 per cent are all weather (concrete or bituminous), 530 or 31.6 per cent are gravel or stone and 285 miles or 16.6 per cent are earth roads. As to ownership and maintenance, approximately 22.3 per cent are Federal and State roads; 72.6 per cent are county, and the remaining 5.1 per cent within municipal boundaries.

Returns to the U. S. Census in 1950 indicated that of 5,440 farms reported in Frederick and Carroll counties, over 3,000 were located on hard surfaced roads, 15 per cent on gravel or shale roads and 33 per cent on dirt or unimproved roads. Twenty-eight per cent of the farmers reporting stated that the distance they must travel over a dirt or unimproved road to the trading center they visited most frequently was a mile or more.

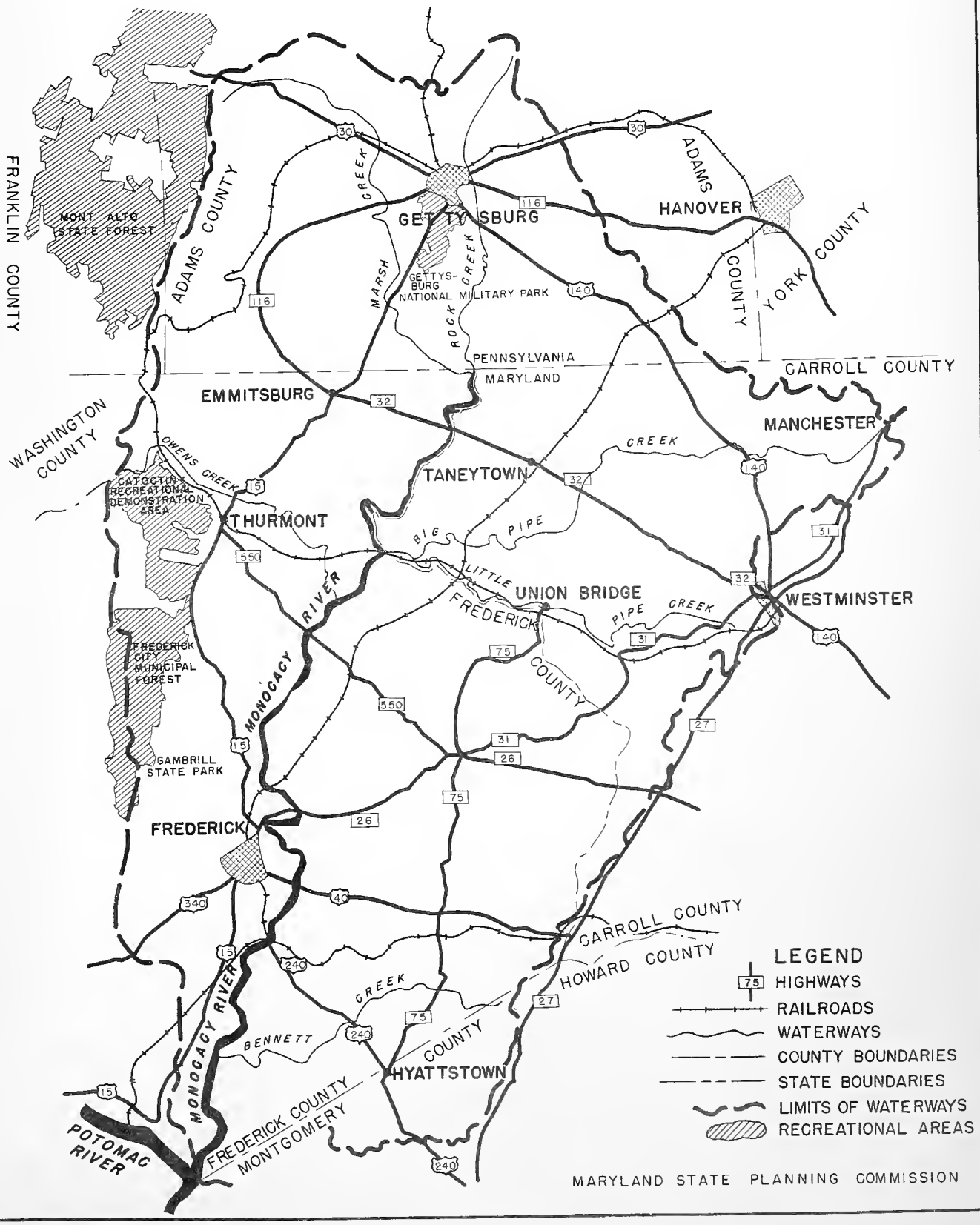
Educational Institutions

Apart from public and private secondary and elementary schools, there are five liberal arts colleges and two theological seminaries in the Monocacy area making an important educational and cultural contribution to the people of the Watershed as well as to the country at large. Among them, they have approximately 5,000 students.

The colleges are Gettysburg at Gettysburg, Pennsylvania, Western Maryland at Westminster, Hood at Frederick, and Mount St. Mary's and St.

MAP III

TRANSPORTATION, FACILITIES AND RECREATION IN THE MONOCACY WATERSHED



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Joseph's at Emmitsburg. Hood and St. Joseph's are women's colleges, Mount St. Mary's is for men while the others are co-educational.

As liberal arts colleges, the institutions offer many similar courses. The most common are biology, business administration, chemistry, ancient and modern languages, economics, education, English, general science, history, home economics, library science, mathematics, music, philosophy, physical education, physics, political science, psychology, religion, and sociology. Hood College also offers courses in child development, clothing, textiles and applied art, foods and nutrition, secretarial studies and institutional management. St. Joseph's also gives emphasis to several of the latter subjects.

These institutions have large campuses with varied athletic facilities.

None of the colleges offer engineering or agricultural courses. However, these and many other related courses are available at the well known University of Maryland, Penn State College and other institutions within easy reach of the people of the Monocacy.

Recreation

The major park and recreation areas are shown on Map III, page 24. Gettysburg is distinguished for the famous national military park which is the annual Mecca of thousands of visitors from the north and south. On the western boundary of the Watershed in Pennsylvania is the very large Mont Alto State Forest and nearby to the north the popular Caledonia State Park area, providing swimming, picnicking, and other attractions.

On the western boundary of the Watershed in Maryland lies the Catoctin Recreational Demonstration area, the famed Shangri-la of Franklin D. Roosevelt, which is maintained by the National Park Service. The

Frederick City municipal forest and Gambrill State Park are nearby. Other recreational attractions are to be found in the park and recreation areas of the City of Frederick, including a park in the municipal forest.

The Watershed is a popular hunting and fishing resort. There are trout in the clear streams of the Catoctin Mountains.

Historical and Scenic Attractions

Besides the scenic views and recreational opportunities to be found in the mountain areas and along the highways, the Watershed is extremely rich in historical and other special attractions. Great generals and armies of the French and Indian, Revolutionary and Civil Wars traversed the Watershed and have left memorials of many kinds. Further, a number of localities were the birthplaces of distinguished men and women of many professions.

Among the numerous points of interest in Frederick City are the following:

Francis Scott Key Hotel
Barbara Fritchie Home
Catoctin County Club Golf Course
Frederick County Fair (October)
County Court House
C. Burr Artz Free Library
All Saints Parish House
Confederate Monument
Hood College
Tory Jail Site
Winchester Hall (for its architecture)
Maryland School for the Deaf, including site where Hessians were quartered
Francis Scott Key Monument
Roger Brooke Taney House

Braddock, and Benjamin Franklin were among the early famous visitors to Frederick; Civil War battles were fought in the vicinity of the city.

Nearby on the Monocacy is the famous Jug Bridge named for a

huge sealed stone jug said to contain a demijohn of whiskey.

Braddock Heights at 950 feet elevation in the mountains has a swimming pool and views into three states.

Catoctin was the site of the Catoctin Furnace where cannon balls were made for use at the siege of Yorktown and plates were constructed for the Monitor of Civil War fame.

Lewistown, 402 feet elevation, has a State Fish Hatchery operated by the Department of Game and Inland Fish.

At Richfields, a Spanish-American War hero, Admiral Winfield S. Schley was born. Lilypons, a 100-acre tract is devoted to raising various species of pond lilies, nile lotus and ornamental fish. This area has been named for Lily Pons, the famous coloratura singer.

At Emmitsburg is St. Joseph's College which was founded by Mother Seton of the Catholic Sisters of Charity. Nearby is the site of the discovery by a St. Mary's college professor of dinosaur tracks in sandstone; some of the slabs may be seen at St. Mary's.

At Sabillasville is a State sanitorium for tuberculosis patients.

At Gettysburg is the National Military Park with more than 2,000 markers and monuments. Air flights may be taken from the local airport over the 2,400 acre reserve. The Caledonia State Park at an elevation of 1,113 feet, and the Michaux State Forest named for French Botanists are nearby.

Near Union Bridge is a farmhouse where William H. Rinehart, the famous sculptor, was born.

Near New Windsor is the Sam Creek Meeting House, probably the first Methodist meeting house in America.

Francis Scott Key, author of the Star Spangled Banner, was born at Terra Rubra near Keysville.

Westminster was important in both the Revolutionary and Civil Wars. On Main Street, near Court, is Gods Well. It was owned by two women who were daughters of the town's founder. In a terrible drought the the story goes, this well alone was not denied the neighbors or travellers. It never went dry. The first Rural Free Delivery of Mail was initiated in Carroll County.1/

1/ Information on attractions from MARYLAND, of the American Guide Series, 1940 Writer's Project, Work Projects Administration.

INTERDEPENDENCE IN THE MONOCACY AREA

In a recent publication, the Frederick Chamber of Commerce points to the feeling among the citizens of Frederick that "What's good for farming is good for Frederick." The Chamber calls agriculture "the dominant part of Frederick County's economy."

What the income of farmers means to Frederick and other urban centers in the basin is partly indicated by the large number of wholesale and retail establishments in Frederick County whose activity depends heavily on the volume of milk and other dairy products, eggs, poultry, grain, fruit, livestock products and other output from the farms.

If, for example, anything serious should happen to the $10,000,000 annual milk production in Frederick County and to the resulting "milk check", the reduced purchasing power of the farmers would hurt the $17,000,000 wholesale and $50,000,000 retail trade of the County. A blow would be dealt all those who sell paint, dry goods, furniture, passenger cars, trucks, farm machinery, general merchandise, clothing, food, and drink. The weekly payroll of $16,000 in Frederick County in the wholesale trades and the millions in retail annual payroll in these counties would suffer.

Even allowing for the income of manufacturing and other establishments whose output does not depend on the buying power in the Monocacy Watershed, a gradual decline of the agricultural economy would be injurious to both the urban and rural welfare of the Watershed.

The interdependence of the city and town dwellers and the farmer is obvious at many points. How long would Frederick County stand sixth and Carroll County eighth among the 24 counties of the State, in bank deposits, if the agricultural economy should fail? New passenger car

registrations rose from 919 in Carroll County and 1,135 in Frederick County to 1,694 and 1,525 respectively, in 1940 to 1949. Would the automobile trade show such a record if the farmers' buying power should seriously fall off?

The interdependence works both ways. Without the big city markets in Baltimore, Washington and other communities, the dairy and other products of the farms would lack buyers. Further the roads over which the farmer brings his wares to market are built from the earnings of not solely the farmers but from city, town and village dwellers whose livelihood is not in farming. Likewise, the schools that the farmers' children attend, and the services received from various government agencies, are paid for by the taxpayers at large.

All elements have a common stake in maintaining and advancing the economic and cultural life of the Watershed. It is obvious that the problems of the Monocacy are not just a concern of the farmers but of all the people of the area.

THE PROBLEMS OF THE WATERSHED

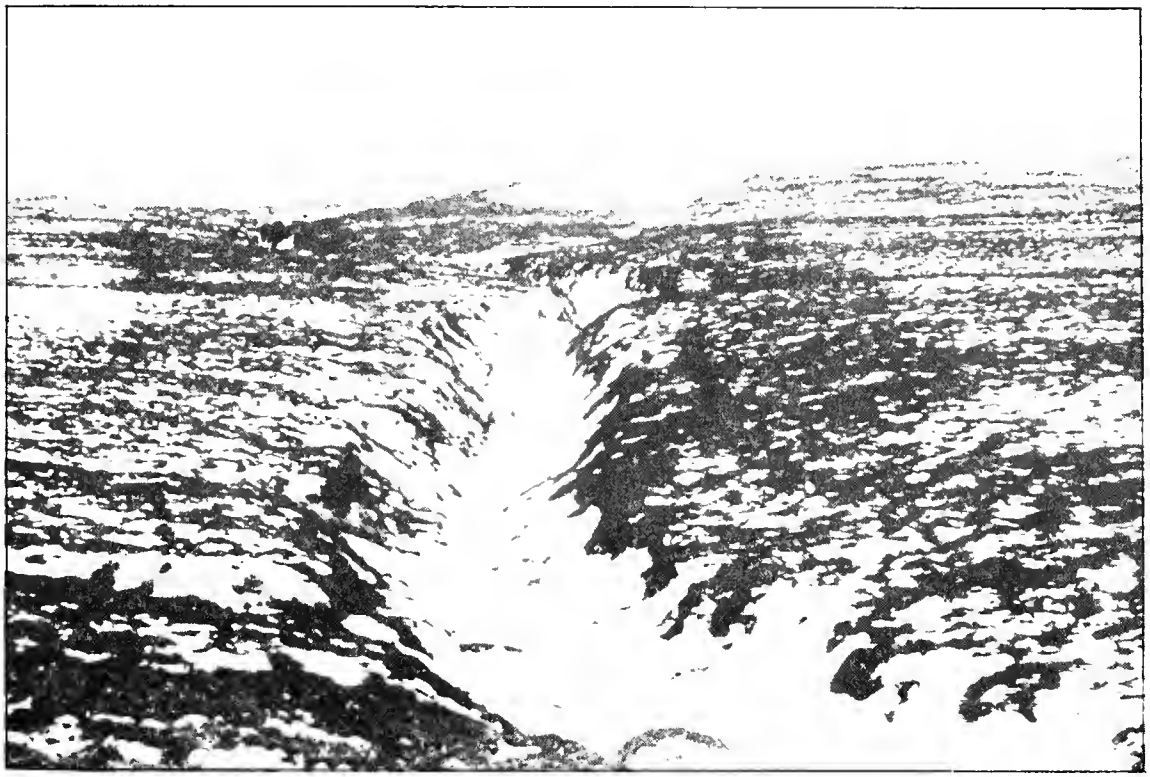
This report has set forth the nature of the Watershed, its soil fertility, its population growth, agricultural and manufacturing development, its cultural advancement and scenic, historical and recreational attractions. In effect, with only a suggestion or a fact here and there of potential or existing problems, the evolution of a highly productive garden spot has been described.

There is another side to the story which Census data and the pleasant statistics of production and mounting buying power do not and cannot be expected to portray. This aspect of the life of the area has developed gradually and insidiously, paralleling the progressive development of the Watershed into a predominantly agricultural economy. The attrition of the land in the Monocacy area is matched in hundreds of watersheds in the United States and does not represent a species of exploitation, waste and carelessness peculiarly unique to the people of Maryland. It is, presumably, the result of the familiar American pattern of using our overwhelmingly abundant resources without realizing that they are exhaustible or planning for their protection or replacement.

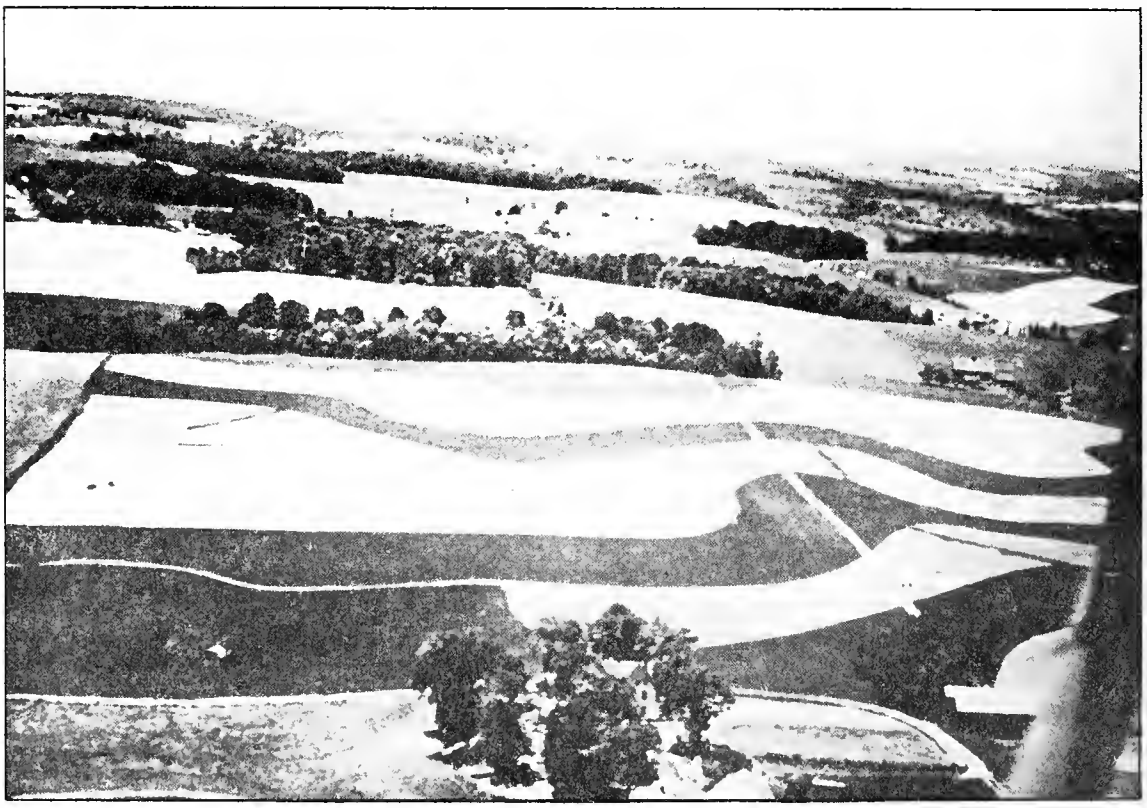
The facts to be shown in this section of the report are convincing and illustrative although details concerning segments of the Watershed are not presented. It will be one of the important tasks of the Watershed Council to extend the data although that is unnecessary for the initiation of action in meeting the problems.

The Basic Problem

To put it in the simplest terms, the fundamental problem of the



Multiply such gullies by thousands and it's clear why the Monocacy is the muddiest Potomac tributary.



On the well planned and well managed farm, erosion is halted and the good soil stays on the farm and pays dividends.

Watershed is that much of the topsoil has gone and the remainder in large areas is being gradually washed off the farms by sheet and gully erosion. The evidence of these losses is not to be found in statistics on the production of farms but in what meets the eye as one looks at the land, examines the results of careful tests and studies scientifically made, observes the turbidity of the streams or even looks at photographs like some of those in this report.

The processes of serious erosion began with the cutting of the forests which, before settlement, covered the entire Watershed and the conversion of hill tops and slopes to the growth of crops without adequate measures for the conservation of the soil. Scharf gives the situation when writing back in 1882. A large proportion of Carroll County already consisted of cleared lands with large productive farms. Streams in this region rising high in the slopes, during times of heavy rain carried down "immense quantities of sediments, spreading them on the flat lowlands." These sediments were "the best ingredients of the forest humus and mineral soil." Again, he wrote, between Little and Big Pipe Creeks, heavy rains and freshets ground the red sandstone into fine mud which "stains the streams for many hours" after floods have subsided. By contrast, Scharf found that Toms, Owens, Hunting, Fishing, Big and Little Tuscarora, Carroll and Ballenger Creeks, flowing out of the heavily wooded mountain area in the western part of the Watershed were "chiefly rapid mountain streams of great beauty and clearness." To a great degree this contrast between the western and the eastern tributaries of the Monocacy persists today.

With three fourths of the forests gradually removed and the land devoted to agriculture, much of it without knowledge of conservation,

the areas of erosion and loss of good top soils steadily expanded.

The forests that remained also fared badly. Most all of them were cut over, some two or three times. There were many destructive fires, some malicious. Fire loss has been greatest in the large concentrated mountain areas in contrast with the small widely separate woodlets on the farms. This resulted in the latter being in better condition, except where the cutting has been destructive and where they have been used for grazing.[1/]

Impaired Forests Contribute to Erosion

Apart from their impairment for timber purposes, the injury to the forest from fires, poor lumbering, and cattle grazing contributes to erosion of the adjacent farmland. The decrease of foliage which retards rainfall, and of deep humus which absorbs it into the soil to become ground water, the destruction of seed bed and hardening of the soil by the trampling of cattle and the survival of crippled and inferior trees through poor cutting methods, all serve to reduce the effectiveness of the forest in cutting down run-off.

The abnormal run-off after a heavy rain sends destructive excess water down the corn fields and pastures, washes away top soil, creates gullies, washes over roads and eventually swells the banks of the Monocacy into flood conditions with a high turbidity.

Turbidity of the Monocacy

The turbidity of the river and many of its tributaries after heavy rainfall is evidence of the extensive erosion in the Watershed. The turbidity is virtually in direct ratio to the precipitation. Analysis of

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1/ The Physical Features of Carroll County and Frederick County, Department of Geolcgy, Mines and Water Resources, Board of Natural Resources, State of Maryland, 1946.

the data compiled daily at the Linganore water treatment plant shows the greatest turbidity during the months of heaviest rainfall. Rainfalls of an inch or more resulted in a rise in turbidity from 150 to 600 parts per million.

The Monocacy is the muddiest of the Potomac's tributaries. The Maryland Board of Natural Resources found in 1948 that there were only eight days between July 1st and October 1st that the turbidity reading was reduced to a point considered suitable for good bass fishing. From May to September, the turbidity averaged five times the maximum suitable for such fishing. While this effect on bass fishing is important in itself, the excessive turbity is chiefly important as a symptom of soil loss in the watershed. The chart on the next page shows the close correlation between the rainfall and the turbidity in the river.

Loss of Topsoil

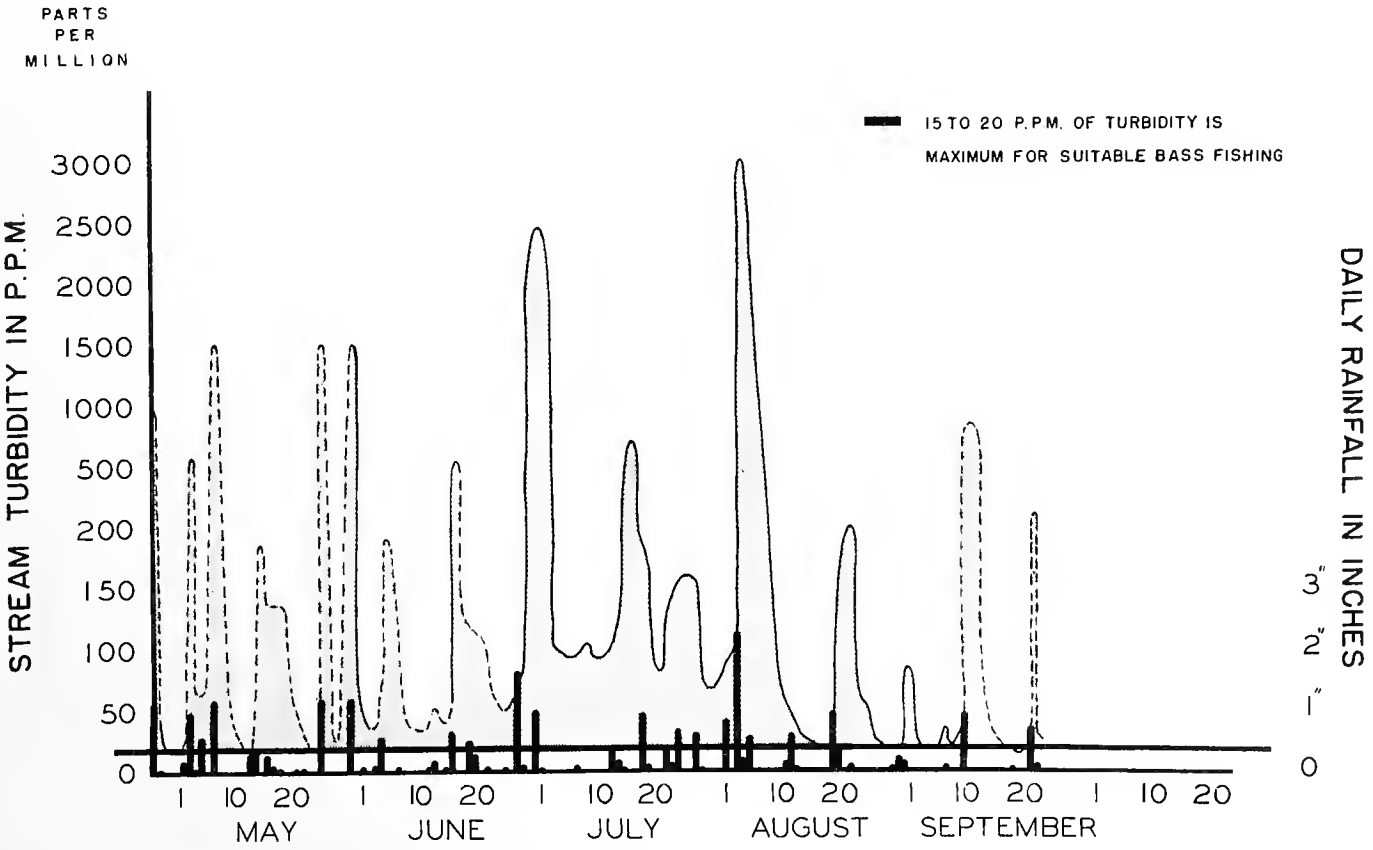
When farming began in Frederick County, there was an estimated average of 15 inches of top soil. After allowing two inches for shrinking, the loss on the average throughout the county is approximately 7 inches with an average of 6 inches remaining.

The Soil Conservation Service at Frederick, which has made an intensive study of the Linganore watershed, which is one of the most heavily eroded basins, has calculated the annual loss in this area as follows:

CURRENT ANNUAL SOIL LOSS, LINGANORE WATERSHED

Use	Acreage	Acre Feet Lost
Crop and Idle	35,685	341.8
Grassland	9,048	8.2
Woodland	11,119	8.3
All other	386	0.3
	56,238	358.6

TURBIDITY IN RELATION TO RAINFALL



SOURCE: MARYLAND BOARD OF NATURAL RESOURCES
DEPARTMENT OF RESEARCH AND EDUCATION

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On the basis of an average of 6 inches of top soil to an acre, this annual loss is equivalent to the disappearance of all top soil on nearly eight 90 acre farms a year.

With six inches of top soil, the lost 716 acres, if planted entirely in corn, might have produced 28,640 bushels at 40 bushels an acre which is the county average. At $9 a barrel, the present price, this adds up to $51,552. This is hypothetical, of course, since the farms are not planted solely in corn. However, the estimate gives an idea of the loss sustained. Even if the farms produced at 30½ bushels an acre which may be expected under present conditions in this area, the loss is substantial.

If a farmer's top soil wore down to 2 inches he would be hard put to produce 30 bushels of corn an acre even with heavy use of lime and fertilizer. He would need at least 200 pounds of fertilizer to the acre at $2. If his top soil is down to an inch or so, it would not pay him to plant corn. When the topsoil becomes shallow, it becomes deficient in more ways than inadequacy of organic matter. It holds less water than deep soil and it lacks the "community life" in which an eight or ten inch soil is so rich.

The loss of good soil in the Linganore, Big Pipe, Little Pipe Creek and many other watersheds clear into Pennsylvania can be translated into bushels per acre of wheat, or barley and to tons of corn for silage and tons of hay. It can be figured in acres at the going price per acre. If it is average for Frederick County, it would be $122 an acre as of 1950.

Some of the top soil washed off farms accumulates in small stream beds to be later swept into larger tributaries and the Monocacy proper by freshets or floods. Some is deposited on pastures. Great quantities are carried far down stream and still other tons are borne

into the Potomac.

In search of rock foundations in 1942 at Jug Bridge, engineers of the Maryland State Roads Commission dug a pit ten by fifteen feet through deposits of top soil to a depth of twelve or more feet!

Major Causes of Erosion

The history of heavy sheet and gully erosion in the Linganore Watershed is laid by the Soil Conservation Service to planting crops on land too steep to plow, too great a percentage of erosion, row crops and poor fertility practices. The planting of corn on slopes is a special cuase of severe erosion. The best soils are now found only on gentle slopes, where woodland has provided protection or in the bottom lands which are subject to flood. Road bank erosion is a small factor, while stream bank cutting is not considered specially serious though accounting for an estimated 8.75 acre feet loss per annum.

Doubtless, the causes of erosion in the Linganore Watershed are general throughout the Monocacy basin. However, in some sections stream bank erosion is bad, bank cutting being aggravated by the action of livestock which have access to the streams at will.

Roadside Erosion

This is caused both by wash from farmland and failure to protect the banks at the sides of the road after construction. The State Roads Commission plants the banks on all its new construction. The problem of roadside erosion is apparently more serious than has been statistically recorded. It challenges local, county and state authorities.

Sanitary and Industrial Pollution

In Pennsylvania, residual sanitary pollution from the Monocacy as it leaves the State is limited and steps have been taken to reduce its

effect to a minimum. The situation as far as industrial wastes are concerned is comparable.

The Maryland Water Pollution Control Commission has stated, "Our observations of the Monocacy River would indicate that industrial and sewage pollution contributed to this river is secondary in magnitude to the pollution caused by heavy silting from soil erosion."

The greatest danger from pollution from industrial and domestic wastes is in times of low water when the water volume is insufficient to adequately dilute the sewage. According to the Steel formula,[1/] "if the water volume is less than twenty times the sewage, nuisances occur." Tests were made of the Monocacy at a point opposite Frederick showing a sewage ratio of 1 to 18 and at the Jug Bridge gauging station approximately 20 miles from the mouth of the river, showing a ratio of 1 to 20. At the mouth of Piney Creek with a drainage area of 35.5 square miles, the ratio between the accumulated sanitary sewage from Littletown and adjacent areas of Pennsylvania and from Taneytown gave a ratio of only 1 to 12. These tests were in August, September, and October in low water.

The principal deterrent to successful fish propogation is from soils pollution. The destruction of fish due to industrial wastes or sewage is intermittent, sometimes being caused by the sudden dumping of acids or harmful wastes, especially at times of low water.

Floods

The watershed has suffered from both flash floods and from the back water from the Potomac particularly at times of floods of great magnitude. However, the damage has not been that of destruction to commercial establishments, industries and homes but rather to the farm land through

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1/ Water Supply and Sewerage, 1947, Ernest W. Steel, C. E.

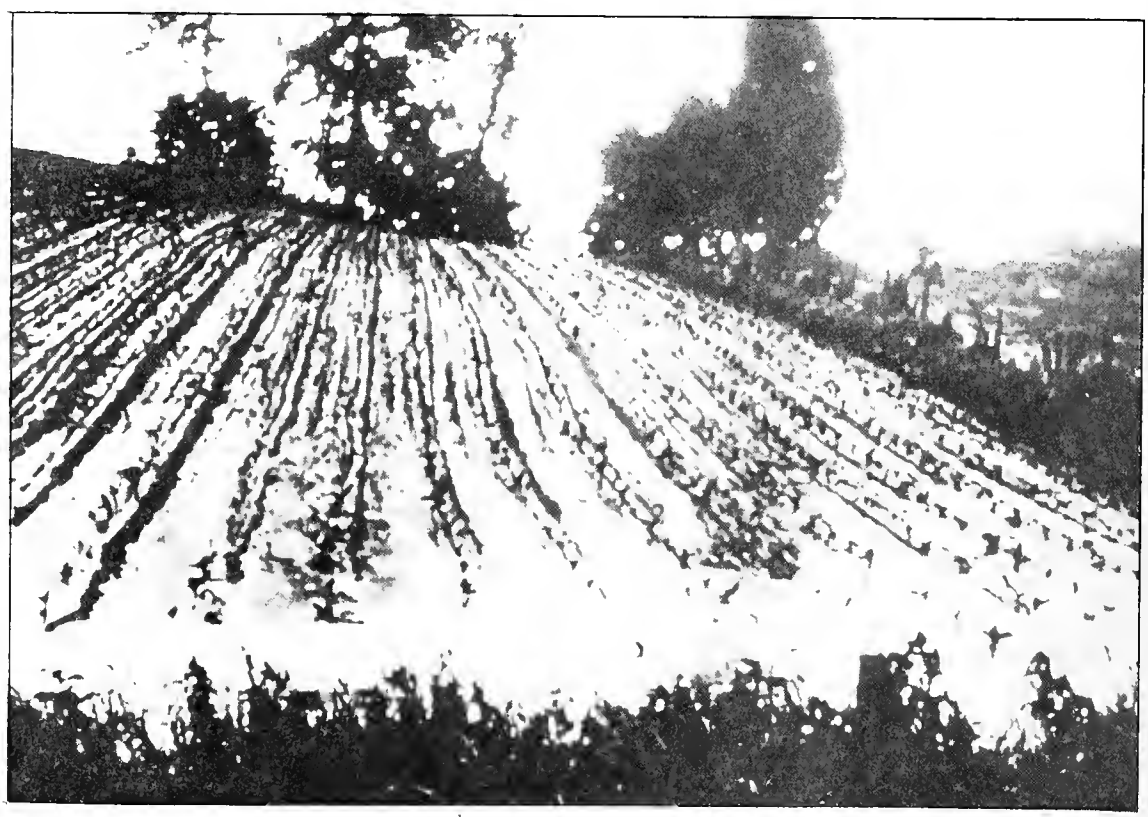
which the river and its tributaries flow.

The farm lands along the streams of the Watershed are principally pasture which has indirectly contributed to the ravages of the streams both when in flood and during normal flow. Not only are the pastures close cropped but the cattle tend to move along the length of the stream banks, cutting them up with their hooves, breaking down the sod and thus contributing to the erosion and cutting of the banks.

The aftermath of floods brings the formation of new or additional channels, removal of fences, deposition of material on adjacent fields and even bridge destruction. An example of the latter in 1945 was the collapsing of one-half of the bridge at Woodsboro on Israel Creek from the force of receding flood waters.

In terms of dollars and cents, there are not the obvious huge flood losses to record within the Monocacy Watershed that are suffered by urban centers in the path of floods. Nevertheless, the Monocacy floods occasion economic loss and are therefore a problem to farmers, State and County Highway departments and to all concerned with improvement and protection of the basin.

This flood was not "an act of god," man was responsible.



It is easy to see why the water and the top soil flowed down to the bottom of this corn field.

PRESENT PROGRAMS OF IMPROVEMENT

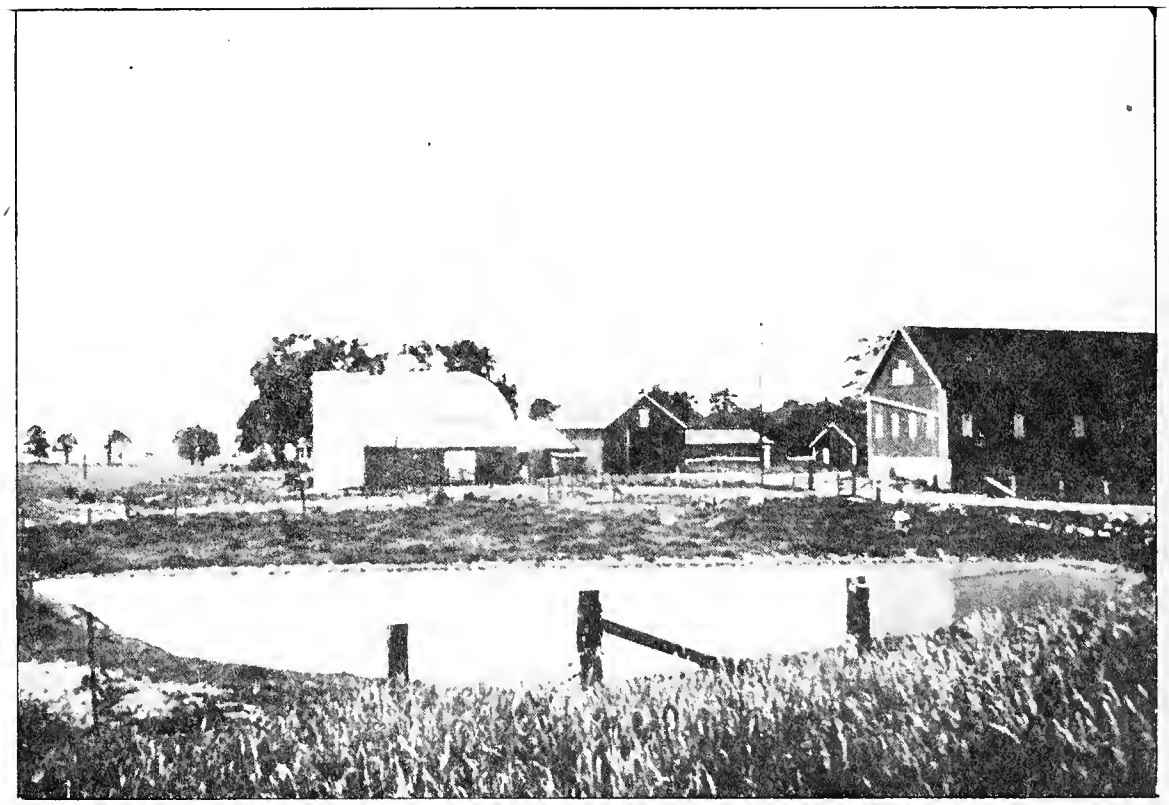
A person who drives through the Watershed can readily see evidence of the progress being made in basic improvements to the land as well as the enormous extent of the problem that remains. He will see one farm laid out in contour strips, a pond, a woodlot fenced from grazing cattle and general evidence of efficient planning and management. Perhaps in the same neighborhood, he will see several with depleted and abandoned fields, corn fields planted up and down hill and deeply gullied land that should be in woods and pasture and that could be brought back into cultivation if rightly treated. In one section, he will see clear streams coming out of well forested areas; in another, streams brown with top soil washed away from hundreds of farms.

Forest Protection

Much of the Watershed's present trouble stems from excessive cutting and unintelligent lumbering as well as fires. Even twenty years ago, the Catoctin Mountain area had one of the worst records in the State for fires, according to the Department of State Forests and Parks. The fire prevention measures instituted by the Department have reduced current acreage loss to less than four one hundredths of one per cent as compared to a State loss of eleven one hundredths of one per cent. The burning of woodlots has been largely eliminated, it is reported. Illustrated, educational talks to both school pupils and to adults are an important element in the program of prevention.

In 1950, only 22.93 acres of forest were burned in Frederick County and only 16 in Carroll County, according to the records of the State Department of Forests and Parks. The reported damage was $110 in Frederick and $37 in Carroll. By contrast in Frederick alone, in a six

A good plantation is a reassuring sight to all who love the land.



Thrasher farm pond. It spells protection against fire, conservation of water resources, prevention of erosion and recreation.

year period, 1912 through 1917, there were 157 fires, 57,600 acres were burned and damages were $112,361. The averages per year were 26 fires, 9,600 acres burned with damages of $18,727. Analyses of both private and public forest needs have been made by the U. S. Agricultural Service, the Maryland Board of Natural Resources and the Extension Forestry Department of the University of Maryland.

Conserving the Land

Since the economy of the Watershed is primarily agricultural, the restoration and improvement of farmland are basic measures. Among other activities, the Department of Agriculture has surveyed the Watershed, prepared estimates of soil conservation needs in terms of cropland, pasture, woodland and other land which are reproduced in this report, prepared a special detailed report on the Linganore Watershed, planned farms and helped to organize conservation districts. Among other measures, an extensive development of farm ponds is proposed in the Linganore Watershed.

Water Resources Investigations

The current and proposed cooperative programs for studying basin water resources as previously reported to the Watershed Council by the U. S. Geological Survey, may be briefly summarized as follows:

Records of stream flow are being collected in the Monocacy River Basin in Maryland at two gaging stations on the main stream and at seven stations on tributaries. Sampling of the quality of the water is conducted at Bridgeport near the Pennsylvania - Maryland boundary. Discharge measurements during low water periods are made on Marsh Creek near Gettysburg and on Toms Creek near Fairfield. Ground water level measurements are taken at observation wells.

These are cooperative projects shared by the Maryland Department of Geology, Mines and Water Resources, the U. S. Army Engineers, City of Frederick and the Pennsylvania Department of Forests and Waters.

Surveying Natural Resources

The Department of Research and Education of the Maryland Board of Natural Resources has completed a fish stream classification map of the Monocacy Watershed and has near completion a study of forest types. A map of abandoned land has been prepared and a census of game kill is underway.

Game and Fish Conservation

The Department of Game and Inland Fish conducts a hatchery at Lewistown and has a program for establishing thirty game refuges and propagating areas. It has studied protective measures for the much abused stream banks throughout the Watershed. A regular fish stocking program is carried out in the basin.

Preventing Industrial and Sanitary Pollution

Legislation for the control of pollution in Pennsylvania and Maryland is considered adequate by the Interstate Commission on the Potomac River Basin. The Commission has pointed out that Pennsylvania's "energetic program of pollution abatement requires both municipalities and industries to prepare plans for treatment works to be constructed at such times as the Pennsylvania Sanitary Water Board may direct." 1/

Pennsylvania's Sanitary Water Board is part of the State Health Department. It required primary treatment of all municipal and industrial wastes and higher treatment if necessary. The Board has issued orders to

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1/ Policies and Program, 1946.

abate all principal sources of pollution in the Monocacy and other Potomac tributaries in Pennsylvania. 1/

The Maryland Water Pollution Control Commission has furnished the Watershed Council with a list of the industries and municipal sewage treatment plants it periodically investigates in the basin. Both this Commission and the State Health Department have power to take action on pollution. The Commission sets standards for the treatment of all industrial wastes and can raise the standard "when more demanding water uses indicate."

Highway and Bridge Construction

State roads and bridges in the Watershed are being built high enough to avoid most floods and their construction is such as to withstand the force of unusual floods. Rip rap is used to protect banks and has been found effective.

This brief summary of current programs in the Watershed is illustrative rather than exhaustive. No doubt much else is in effect by individual citizens, agencies and organizations not here mentioned. However, these observations will serve to recognize the forces at work and to introduce the next phase of this report which will help lay the basis for a program of action.

1/ Report of President's Water Resources Commission, Vol. 12, 1950, p. 596.

BASIS OF AN EFFECTIVE PROGRAM

In the previous pages, the extent and characteristics, the natural resources, the economic and cultural development of the Watershed, its basic problems and the work in progress toward meeting those problems have been set forth. It has been indicated that despite the development and the prosperity of the area, an attrition of topsoil, the farmers' most valuable asset, has taken place, bringing in its train other injury to the people of the area, and that this loss is a serious economic threat to the Monocacy region.

It remains to suggest the approach and direction, though not the detail, of a program to meet the problem of the Watershed.

Putting The Problem Into Focus

In the Texas Panhandle, lives a successful and prosperous lawyer and former judge, who is fond of saying that until he was sixteen he never had a pair of shoes and that he was "the boy at the head of the hollow." This familiar quotation helps one to visualize the boy's circumstances.

In considering a concerted program for the Monocacy, it is appropriate to visualize the type of situation, the kind of farm and the farmer that, at least at the outset,merits first consideration from the Council. A location may be thought of in a sub-watershed of the Linganore or Big Pipe Creeks. The farm is one of, say, 60 to 70 acres, general not dairy. It produces grains and hay, has woodlot and blue grass pasture in the stream bottom, the latter periodically flooded. The hillsides are eroded and have been for a long time so that the better soil is now on the easy slopes and in the bottom land. The average topsoil is down to, perhaps, 4 inches or less. The stock grazes at will in the pasture and can approach

the stream anywhere as there are no fences and practically no protective trees or bushes along the banks. The banks near the stream are badly cut up by the cattle.

Perhaps the farmer is overworked and overtired. He knows for example, that it is not smart to let the stock graze in his woodlot, which is none too healthy but he has never seen to it that it was fenced. He is so close to the daily round of his work that he does not picture clearly the losses he is sustaining in his poor farm practices and the advantages he might gain from change. Like most people he gets most of his ideas from what he sees and hears. He needs to "be shown."

Major Objective

Erosion and soil loss have been described as the outstanding problem. They are the major objective in the attack to be made by the Council. However, to help the small farmer see the importance of the problem and arouse him to action, is the first task. Directly connected with this objective are the conservation and improvement of woodland.

Secondary objectives are flood control, conservation of water supply, prevention of sanitary and industrial pollution and the advancement of wildlife and recreation.

Approach

The first step is to help the small farmer identify the problem of erosion and soil loss, to see its importance, and to arouse him to action. The conservation and improvement of his woodland is closely connected with achieving a solution to the problem.

The farmer has his own circle of neighbors and friends with whom he associates and works on a natural basis of mutual confidence, influence and assistance. The family on the next farm down the road may not be as

initimate as the one beyond but there is a group in the area that can be identified as neighbors and who provide a logical basis for cooperation. In the group are natural leaders whose word and example carry special weight.

The approach to the farmer is through such a natural group with its indigenous leadership. Whatever the improvement, and whether in a rural or urban setting, it begins through the initiative or response of a local leadership. The Council will find the natural leaders, convince them of the urgency of the problem and show them the resources for meeting it. Through the leaders, the group of neighbors will be reached.

Selection of Areas For Projects

The Council may wish to consider series of special projects with natural neighborhoods or groups of neighborhoods in a subwatershed such as was identified at the beginning of this section of the report. Given the local interest and readiness to go ahead with a project, the Council could bring to the neighborhood groups the concerted technical and promotional assistance of its constituent membership.

This procedure was followed with recognized success in a section of a sub-watershed in the Brandywine Valley with 85 farms involved. In the selection of the area for the project, an important consideration next to its having a logical social basis is its suitability for facing not simply one phase of the problem but all phases or most of them. The evidence of improvement from the measures taken will be more convincing if, one by one, several aspects of the central problem of erosion and soil loss are attacked.

The seven fold scope of the problem is, as pointed out earlier in the report:

1. Forest management.

2. Comprehensive farm land conservation, improvement and development.

3. Solving the problem of soil pollution in the stream, closely connected with the above.

4. Removal of industrial and sanitary wastes.

5. Flood control.

6. Conserving and increasing wildlife and fish.

7. Conserving, improving and increasing recreational facilities.

Take an Area That Has Been Studied

Since early action is desirable, it is logical to start a project in a watershed that has been studied. As stated, the Soil Conservation Service has made an intensive study of the Linganore Watershed, appearing in report form. With the exception of sanitary wastes, the problems of the Linganore are as above. Time will be gained by concentrating first efforts in such an area or similar ones where much basic information has already been brought together. The entire Linganore Watershed is too large for a special project since it contains 56,238 acres, and 452 farms. A small portion of it could be selected and the energies of the group concentrated on an approved program.

Informal and Graphic Methods

Experience indicates that gatherings of the neighborhood farm groups in such an area should be informal and the presentation of materials should be graphic. In this graphic age, people obtain many of their ideas and entertainment through picture magazines, such as Life, television, movies and billboards. Recognizing the importance of the graphic approach, the Soil Conservation Service at Frederick utilizes an extensive collection of kodachrome slides among other materials. "One picture is worth

10,000 words."

Depending on the group's need for elementary facts on the nature of the land and water resources of the area, the geology, soils, rainfall, ground water, run off and erosion may be presented in simple form through drawings, charts and pictures as a foundation for their understanding of the local needs. The Brandywine Association in Delaware and Pennsylvania has been successful in convincing farmers in the Brandywine Watershed of the importance of their problems by displaying photographs of the effects of erosion on their own farms at informal gatherings. Some farmers have been amazed at first hand views of conditions on their own land of which they were barely aware. Very convincing to a group, is the testimony of a leader in their own group.

When convinced of the importance of the problem, the farmer will inquire from what sources help can be had, at which point he can be referred to the technicians who are ready to help him. Through such an informal approach, towns have been led by the Brandywine Association, to reforest nearby barren hills; soil conservation districts have been organized and numerous farms replanned; industrial and sanitary pollution problems have been attacked through legislation and action taken by industries and municipalities; "future" farmers have been encouraged to develop conservation methods through awards and numbers of teachers have been instructed in procedures for conservation and developing the resources of the Brandywine Valley.

"Selling" A Program

The farmer will be interested in the evidence that good conservation practices reduce erosion, increase soil fertility, improve vegetation and reduce floods. However, if this is translated into increase of crop

yields, in terms of 35 or 40 bushels of corn per acre versus 25, and saleable at seven or eight dollars a barrel, he will be persuaded to act. Fortunately, the technicians of County, State and Federal agencies available to give him information and suggestions can provide just such facts as well as an immense amount of technical assistance.

The United States Department of Agriculture has made studies showing that crop yields begin to decline with the loss of each inch of topsoil and that yields have a direct relation to topsoil depth.1/ However, even if a farmer should study this report he would not be nearly so convinced or spurred to action as if he were shown that by conserving and building up his soil he can be hundreds of dollars to the good.

1/ "Crop Yields Lowered by Erosion," Soil Conservation Service, February, 1949.

GENERAL PROGRAM FOR THE MONOCACY WATERSHED

Whatever special emphasis may be required in individual sub-watersheds based on close analysis of their needs, the direction of improvements in the area as a whole may be indicated.

Point number one is certainly the practice of sound conservation measures on farmland, particularly on general farms. The practices recommended by the Soil Conservation Service in 1948 are reproduced in Table I. Whatever alterations in these recommendations may be appropriate after two years of experience and further study, the estimates provide a practical basis of consideration by the Council. Many of them have application to the conservation of wildlife, forest protection and recreation as well as to conserving and improving farm production.

Forest Management

The second broad field of effort is in the protection and expansion of forests and farm woodlots. In 1949, the Department of Forests and Parks recommended that 15,000 acres in Frederick and Carroll counties, then in cultivation or pasture, be planted to trees and that 5,000 in forests be replanted.

A report in 1951 based on a survey of West Maryland forests, by the Forest Service of the United States, recommended that 29,000 poorly stocked acres in Carroll and Frederick counties and 15,000 acres in Montgomery County be replanted.

It has been held that the forested areas in Frederick, if properly managed, could meet all the lumber requirements of the county and that the average increase of 40 to 45 cubic feet per acre could be raised to an

TABLE I

SOIL CONSERVATION NEEDS OF THE MONOCACY RIVER WATERSHED

Present Land Use	Conservation Practices Recommended	Unit of Measure	Pennsylvania	Maryland	Total
	Private Ownership:				
Cropland:	Annual legume and/or grass portion of soil conservation rotation	Acres	33,659	60,617	94,276
	Contour strip cropping	Acres	43,212	115,188	158,400
	Waterways and outlets	Miles	251	141	392
	Field diversions	Miles	125	303	428
	Farm drainage	Acres	2,001	3,698	5,699
	Wildlife borders	Acres	1,674	4,136	5,810
	Farmstead and field windbreaks	Miles	351	613	964
	Hedges	Miles	754	1,634	2,388
	Perennial hay crops	Acres	16,085	16,804	32,889
	Liming	Acres	82,220	174,236	256,456
	Fertilizing	Acres	82,220	174,236	256,456
Pasture:	Rotation grazing	Acres	13,366	100,150	113,516
	Seeding	Acres	11,332	62,325	73,657
	Contour furrowing	Acres	755	4,757	5,512
	Drainage	Acres	2,610	8,744	11,354
	Fencing	Miles	160	889	1,049
	Farm ponds	Number	681	722	1,403
	Liming	Acres	17,821	101,437	119,258
	Fertilizing	Acres	17,821	101,437	119,258
Woodland:	Improvement and harvest cutting	Acres	36,841	147,845	184,686
	Fire protection	Acres	36,841	147,845	184,686
	Grazing protection	Acres	3,039	9,194	12,233
	Forest planting	Acres	4,151	8,631	12,782
	Fencing	Miles	46	271	317

(Continued)

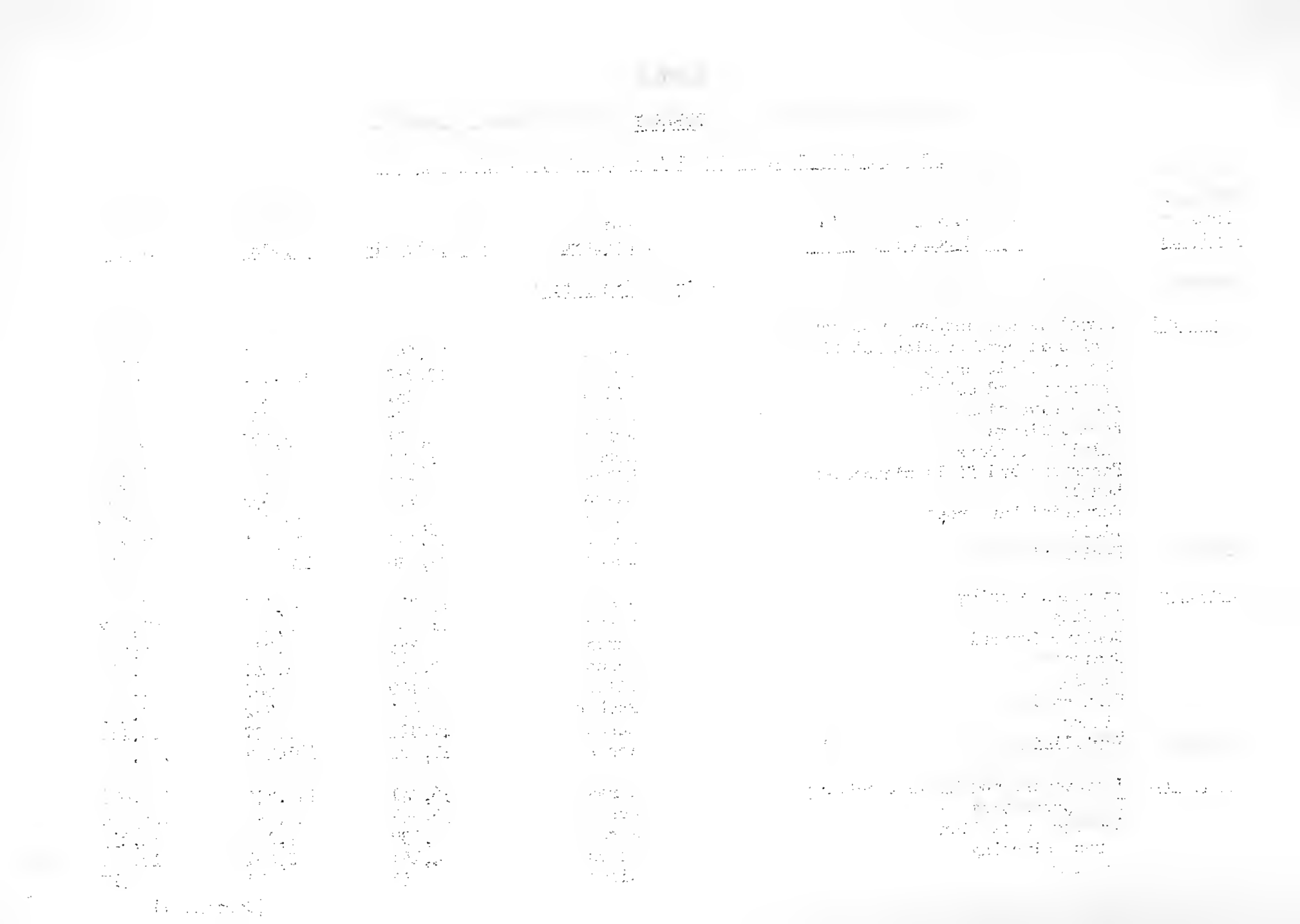

TABLE I (Continued)

SOIL CONSERVATION NEEDS OF THE MONOCACY RIVER WATERSHED

Present Land Use	Conservation Practices Recommended	Unit of Measure	Pennsylvania	Maryland	Total
		Private Ownership:			
Other:	Tree planting	Acres	2,361	4,659	7,020
	Seeding	Acres	260	529	789
	Stream and shore protection	Miles	375	1,455	1,830
	Pond management	Number	448	363	811
		Public Ownership:			
Woodland:	Improvement and harvest cutting	Acres	None	10,674	10,674
	Fire protection	Acres	None	10,674	10,674
	Forest planting	Acres	None	97	97

Estimates furnished by Soil Conservation Service. 1948.

average of 90 cubic feet.[1] It is possible that it may prove profitable to grow some trees for pulpwood. A large acreage in the Michaux State Forest in Pennsylvania is in pulpwood.

Flood Control and Water Supply

While farm and forest conservation methods will help greatly to reduce the peaks of floods and raise low stream flow, the construction of small storage dams, channel improvements and the improved care of stream banks should be considered as flood control measures. No emergency in domestic and industrial water supply has yet appeared, but the expansion of population and the increase of industry in the Watershed deserve the application of forethought to the quality and quantity of water supply. Reservoirs may be required for future water supply. Meanwhile, the measurement of sediment, dissolved minerals, and pollution in the river, through additional sampling stations and observation wells for study of the fluctuation of the water table, as recommended by the Geological Survey, are desirable.

Roads

Further extension of the progress made in building good roads accessible to the farmer and the protection of all roads from erosion are an important concern to the Council.

Wildlife and Recreation

Advantages to wildlife and to recreation in general will grow out of the previous measures. In addition, the establishment of game refuges and propagating areas, stocking of streams, establishment of hedgerows and

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1/ The Physical Features of Carroll County and Frederick County, Department of Geology, Mines and Water Resources, Board of Natural Resources, State of Maryland, 1946.

replanting of stream banks among other activities are indicated.

The Watershed along with the entire State should be studied for improvements and addition to the system of parks and recreation areas. This review should include the stream valley of the Monocacy, where with the clearing of the water, parks or picnic areas incorporating dams and lakes may appear desirable. Such a study should embrace all the mountain areas as well, including the nationally administered Catoctin Recreation Area.

Tourist Attractions

The educational, scenic and historical attractions of the watershed are probably more numerous than is commonly thought. They may well be further advertized and exploited among Marylanders and Pennsylvanians in the outside world. Such promotion could substantially increase the income of the area through services dispensed to tourists and vacationists.

SUGGESTED PROGRAM OF ACTIVITIES OF THE MONOCACY VALLEY COUNCIL

In order that the Monocacy Valley Council may proceed with the development of its program to provide the people of the Monocacy Watershed with a long-range integrated program for the optimum development of their resources, it is suggested that the Council might consider the following proposals:

1. Set up a simple organization with office and staff.

2. Establish immediate working relationships with existing Federal, interstate, State, and local agencies dealing with the various aspects of the problem.

3. Initiate several demonstration projects in subwatersheds so that the results and benefits of an integrated conservation program will become increasingly apparent to all those in the Watershed. As these projects should have basin-wide support, the choosing of appropriate areas are of the utmost importance. Such undertakings will help improve the techniques for handling Watershed problems and afford the Council the means by which it can solicit increasing participation in its program.

4. As any plan of action for the restoration and preservation of the natural resources must find its support in the farm owners and operators of the area, their interest must first be captured. This can be done by the Council by showing what has occurred in the past, and by pointing out the trends leading toward significant future losses. Available technical assistance should be called to the attention of and made available to the farmer in planning his individual production and program.

5. The future of the Monocacy Watershed, however, ultimately involves all the people of the area. To most effectively bring them to grips with the Watershed problems and their solution, it is suggested that frequent conferences be held which will include all interests concerned: the farmers, the merchant, the banker, as well as the specialist.

6. In carrying out recommendations 4 and 5, the Council should carry out a program which includes educational and publicity activities: such as, speakers; the production and exhibition of still and motion pictures; newspaper releases; printed material; radio talks and television programs.

7. The Council should assist and encourage local schools and colleges to incorporate diversified conservation courses in their curricula. It should be remembered that those most amenable to change are the youth of the area. The teaching and demonstration of sound conservation principles may well prove, in the future, to have been one of the Council's most productive activities.

8. Progress reports on the solution of the area's problems should be published and widely distributed among the people of the area, so that the experience of one participant or area may serve as an example, as well as a spur to action, for others.

GENERAL POLICIES AND PROCEDURES

There are some general policies and procedures that deserve attention in framing a course of action for protecting and advancing the interests of the people of the Monocacy area. These will be referred to in brief.

United Cooperative Action is Imperative

It is a truism that the problem is many sided and that no one group of citizens nor any one agency has the answer. The bulk of the technical services required may fall more heavily on some agencies than on others but many have a contribution to make in the field of research, technical assistance, promotion, organization and education. Plans for the Watershed should be comprehensive in attacking all phases of the basin's problems and in aiming at benefits to all the elements of the Watershed's population. Some problems have prior claim as to timing, others are less immediate and less serious but all should appear in the total, flexible project.

Personnel

It appears clear that the Council will require a full time executive director who will not only be technically qualified for leadership responsibilities in behalf of the Council but will also have the ability to organize educational and public relation programs. In time, he may require one or more assistants.

Budgets

Funds will be required for the payment of personnel and their expenses, for printed matter and other costs connected with the work of the Council. Preferably the money should be raised from among the business and farm interests who have most at stake in the Council's work. An

alternative may be to have local and state governments share in the costs through appropriations given to the agencies which are most concerned. It is, of course, recognized that governments at various levels already are contributing to the program through existing channels and by appropriations.

Additional Data

It has been suggested in this report that additional basic data are required. One of the functions of the Council would be to review what is available and to determine in what areas additional information on such elements as ground water, stream flow, pollution and water quality is required. Forecasts of water supply needs is an example of one kind of desirable information. Local, state and federal agencies already at work in the Watershed, it is assumed, would carry out the responsibility of furnishing the data.

The forthcoming study of the Linganore, the studies in the Watershed of the Natural Resources Board, further investigations of the Geological Survey and other materials might be sponsored as a series by the Council.

Determining Value of Projects

For basic and pertinent data and the major work required in the Monocacy such as research and forest and land management, the agencies and machinery already exist and the extension of their work as required would not involve any policy changes as to expenditures. It would be different if the Council considered recommending capital expenditures; for example, storage reservoirs for flood waters or improvements in the channel in the lower Monocacy. These projects would involve substantial sums of money. The estimated long-term benefits, both economic and non-economic, should be balanced against estimated costs. Such evaluation

should be applied to all proposed improvements for all types of projects in the Watershed before taking action. Of course, where established practices such as forest and farm land management have obviously proved themselves,no special evaluation would be required.

Financing Improvements

The number of possible projects in the program that promise benefits beyond a given urban community, a subwatershed or even beyond the boundaries of the entire Watershed are many. In such a case consideration must be given to the question of sharing in costs by the respective governments, by one or more communities, by industries, and so forth. Recommendations on this point would be the responsibility of the Council in connection with proposals it makes for construction or improvements.

SUMMARY

In the Monocacy basin, nature contrived a region of ample rainfall, basically fertile soils and a climate suitable for the growth and nurture of generous natural resources. These natural resources are the foundation of prosperous agriculture and dairying, growing manufactures and a significant cultural development. The area is one in which the urban and rural interests are mutually interdependent, with agriculture as the basic economic asset.

The insidious, progressive loss of topsoil due to the destruction of three fourths of the forests and the development of farms without adequate regard to conserving the soil, is the area's major problem. Its effects are visible in the turbidity of the streams draining into the Monocacy from the east, the aggravation of floods, extensive sheet and gully erosion and mounting deposits of soil in the lower valleys. (In terms of current prices for corn, more than $51,000 are lost annually through the disappearance of topsoil in the Linganore Watershed alone.) The small general farms are the worst sufferers. Sanitary and industrial pollution is a minor problem when compared with the magnitude of the annual erosion loss.

The uncoordinated beginnings of the solution of the region's problems are already underway in the protection of the woodlands from fires, forest management, soil conservation, game and fish conservation, extension of well built roads, the establishment of municipal and industrial sewage treatment plants and basic studies of water and other resources.

However, the major task lies ahead through a faster moving and larger scale program. To put an end to the number one problem, loss of

good soil, effort must be focussed first on the small, general farm. The natural neighborhood leader among a group of farmers is the key person through whom interest must be aroused and action initiated.

Projects for a limited number of contiguous farms in natural neighborhood units are recommended to the Council. For the purpose, areas should be slected that pose all of the varied aspects of the problem, not just one or two. Graphic methods of bringing the urgency of the problems to the farmers are imperative as generalizations will not serve. Technically, most of the methods required to meet the problems are known to the public and private agencies which stand ready to serve or are already at work and the Council's work is to bring the farmers into receptive attitudes toward utilizing these available services. A series of reports on special phases of the problem based on studies now underway may be sponsored by the Council.

The problem is big. Not just a few acres of farms or forests are involved. There are several hundred thousand acres of cropland, pasture and woodland for which specific types of conservation practices are required. Extensive replanting of large forested areas is called for. Wide scale restoration of wildlife and recreational attractions is necessary. Such a great task will require teamwork of the most harmonious kind.

SOURCES OF INFORMATION AND ASSISTANCE

Among the sources of information and technical assistance on watershed problems are the following:

1. The President's Water Resources Policy Commission, 718 Eighteenth Street, N. W., Washington 25, D. C.

   This recent two volume report includes much material on the Potomac and its tributaries among other data. This report should prove a "gold mine" to the Council.

2. Corps of Engineers, Department of the Army.

   The Engineers have made extensive studies on the solution of watershed problems in the Potomac and other rivers.

3. Interstate Commission on the Potomac River Basin.

4. U. S. Department of Agriculture:

   Soil Conservation Service
   Extension Service
   Forest Service
   Production and Marketing Administration

5. U. S. Geological Service

6. National Park Service, Department of the Interior

Maryland Agencies

7. State Soil Conservation Committee

8. Water Pollution Control Commission

9. Board of Natural Resources:

   Department of Research and Education
   Department of State Forests and Parks
   Department of Game and Inland Fish
   Department of Geology, Mines, and Water Resources

10. Extension Service, University of Maryland

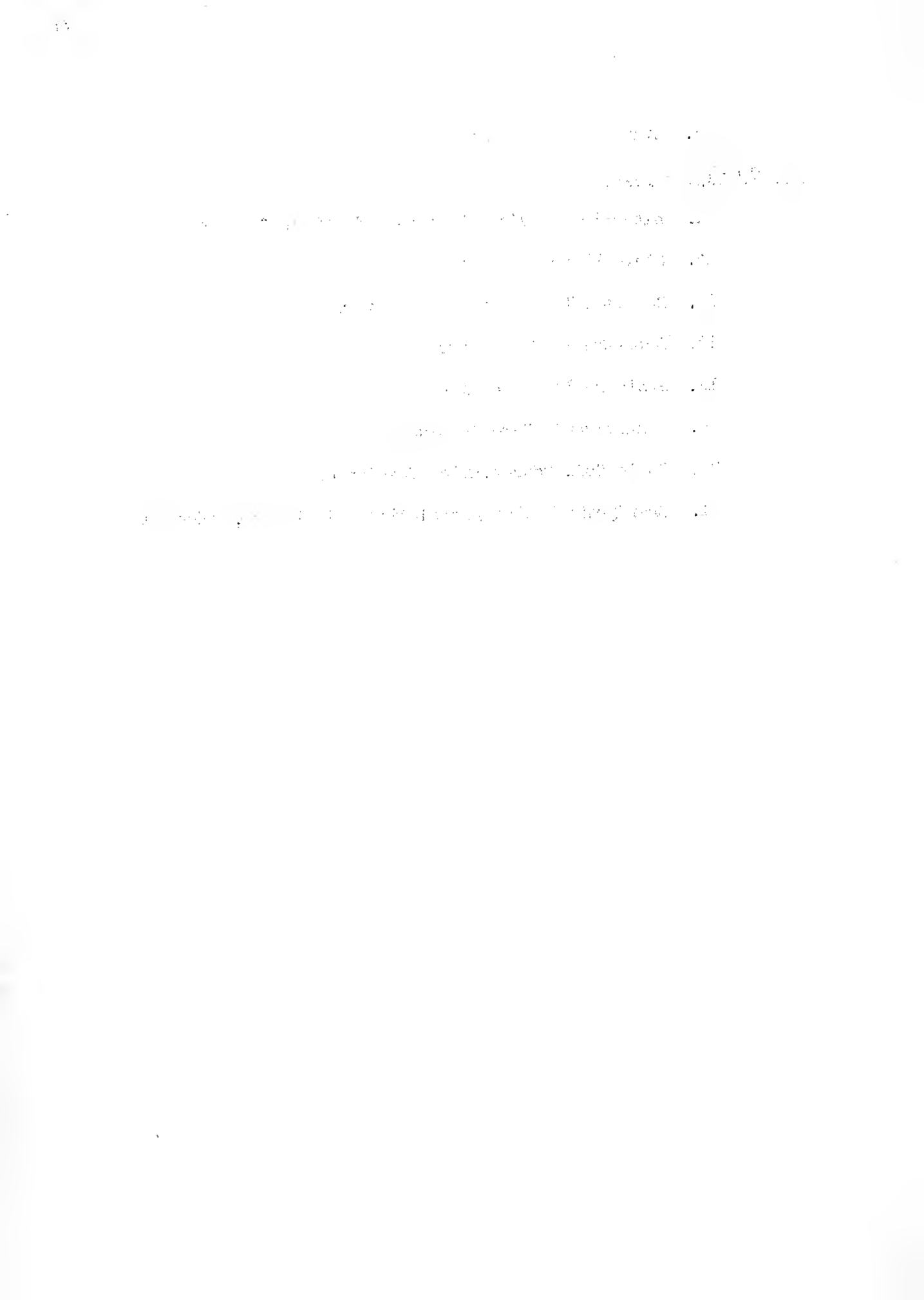
11. State Roads Commission

12. State Planning Commission

13. State Health Department

Pennsylvania Agencies

14. Extension Service, Pennsylvania State College
15. State Planning Board
16. Department of Forests and Waters
17. Department of Highways
18. State Health Department
19. Pennsylvania Game Commission
20. State Soil Conservation Commission
21. Brandywine Valley Association, Wilmington, Delaware



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